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ABSTRACT

This teaching guide contains a variety of environmental education activities divided by grade level. A general objective is stated, followed by as many as 25 related activities. Each activity is short, and many are followed by discussion questions. This guide should prepare students for critical appraisal and responsible decision-making in utilizing the earth's resources. (Author/RH)

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POPULLUTION OR CONSERVIVAL

A Guide to Activities and Strategies in Environmental Education

6 - 8

RATIONALE

The activities and strategies in this guide have been compiled to direct and assist you in implementing the middle school environmental education objectives.

We believe the teaching of environmental education is vital to our survival. Increasing population growth and wasteful consumption will severely limit the fulfillment of human potential and greatly diminish the quality of life. We hope that this guide will enable you to prepare students for critical appraisal and responsible decision making for utilization of the earth's resources.

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ENVIRONMENTAL CONCEPTS

The earth is a vast but limited natural system.

The total environment is in constant change.

A living thing is the product of its heredity and environment.

All living things, including man, are interdependent with one another and with their environment.

OBJECTIVE

To describe how plants and animals coexist and are interdependent within different communities and to identify man as a part of those communities.

ACTIVITY 1.

This activity allows students to use their imaginations in interpreting information. Instruct students to draw the image they envision as they listen to the material, "The Earthworm, A Segment Worm."

THE EARTHWORM, A SEGMENT WORM

Earthworms are also called night crawlers. They burrow in the ground. When rain floods their burrows, they come to the surface to avoid drowning.

People go out with flashlights at night, or early in the morning, before the ground dries. They collect the night crawlers. The worms make good fish bait.

Earthworms belong to the segment worm group. Their body is made of segments or sections. The segments are linked together, in the way railroad cars are linked together to make a train.

The segments can stretch and shrink. This makes it easy for the earthworm to crawl and burrow. The earthworm is built for easy living in the ground in other ways also.

The earthworm's body plan is something like ours. The worm's digestive system is a long inner tube, with a mouth at one end and an anus at the other.

The worm burrows by eating the soil in front of it. As the soil is squeezed down the digestive tube, the plant and animal matter in the soil is digested. The waste material left behind is good fertilizer. By burrowing, the earthworm plows the ground. Air and water can then soak in easily. Plants grow well in ground that has many earthworms.

The earthworm is a complex little creature. It has a well developed circulation system around the digestive tube. Several pairs of hearts pump the blood. It even has a small brain.

Earthworms reproduce by mating. Each worm is both male and female.

ACTIVITY 2.

Terrariums give opportunities for making observations about soil and the interaction of plants and animals. Have students bring two wide-mouthed jars, some dark soil which contains leaf mold, sandy soil, and some earthworms. Make layers of soil in each jar, and label each jar. Put earthworms in one jar. Make the earthworms feel at home by wrapping dark paper around the jar. In a few days remove the paper, and allow students to observe both jars.

1) Compare the mixing with that of the jar without worms.
2) How did the earthworms contribute to the fertility of the soil?
3) How are earthworms able to grind and pulverize the soil?
4) How do they get materials into their mouths?
5) How do they move about in search of food?
6) What do you notice on top of the soil in the jar containing earthworms?

ACTIVITY 3.

Allow students to plant some bean seeds in the soil with earthworms and the same number of seeds in the sandy soil. Use an equal amount of water on each. Observe the growth in each jar and record the observations.

1) In which jar is there more growth?
2) Why?

ACTIVITY 4.

Divide students in small groups. Each group should choose a person to record the group's list. Allow students about five minutes to name foods that come from plants.

After the lists are made, ask students to decide whether these food products come from plants directly or indirectly.

1) Which food could you not have if there had been no plants to furnish food for the animals that gave you food?
2) Why does all animal life depend on plant life?
3) What needs, other than food, are supplied by plants?
4) What is being done to help develop more desirable plants?
5) Explain how you are dependent on green plants, and green plants are dependent on you.

ACTIVITY 5.

This is an activity for small groups or pairs of students. They will record those items which can be found in their square foot plot of ground.

ACTIVITY 5. (Continued)

1) How many objects were observed?
2) What are the names of the objects?
3) Is there evidence that some materials have undergone change?
4) Is there evidence of the presence of man?
5) Which objects or phenomena do you want to investigate further?

ACTIVITY 6.

View the film, "Me-Cology," and encourage students to make "Me-Cology" booklets to illustrate ways they can protect plants and animals from harm.

ACTIVITY 7.

Read with students "The Glut" cartoon. Allow students to sketch cartoons to contrast harmful and protective environmental practices.

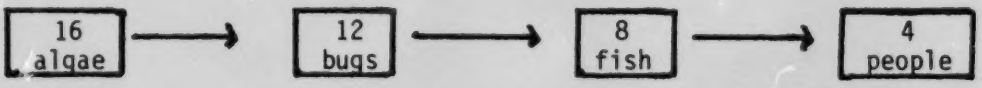
ACTIVITY 8.

Food chain mobiles are easily made and clearly show the relationships that exist between living things. Supply wire hangers, construction paper, discarded paper sacks, and old newspapers for students to use in making the components of the food chain mobiles.

1) What is the first component of all food chains?
2) What would happen if a link in this chain should be missing?
3) Who is the end of many food chains?
4) How can man strengthen the food chain?

ACTIVITY 9.

The simulation of the food chain is designed to elicit student feelings for discussion.



Divide class into four groups with the proportions noted above. Any extra students should be placed in the "algae" group. Each student (except those in the "people" group) should be given a handful of white beans.

Explain to children that groups can proceed to get "food" (beans) from the group immediately below them. Let students do this for about ten minutes.

ACTIVITY 9. (Continued)

Inform the students that persons have polluted the environment; give one handful of black beans (pollution) to each person in the algae group. Tell them that they can pass the beans up the food chain as others come for beans! If they do not get rid of the pollution beans this way, they will die immediately.

Each "people" who gets a black bean dies.** When there are no more "people", then each "fish" who has or gets a black bean dies, then each "bug" and so forth.

When only the algae group is left standing, those with black beans "die" too.

**One "dies" here by sitting down! The teacher should point out that students "die" with a black bean, and by getting no beans at all. They must ask for beans and they must accept black when given!

Discuss student feelings about this activity--and the impact of pollution.

ACTIVITY 10.

To play Ecology Rummy, make a deck of 52 cards marked as follows:

19 water-air-soil-sun (WASS) cards
8 green plant producer cards
6 plant consumer cards
3 meat consumer cards
8 decomposer cards
8 polluter cards

Two or three may play. Choose for dealer. Mix the cards. Deal eight cards to each player. Turn up one card. Place the rest of the deck face down. Starting at the dealer's left, each player in turn draws a card. He may draw the top card from the deck, or the top face-up card. He discards one card face up.

Each player tries to make chains as follows:

WASS-producer-decomposer
WASS-producer-plant consumer
WASS-producer-plant consumer-decomposer
WASS-producer-plant consumer-meat consumer
WASS-producer-plant consumer-meat consumer-decomposer

A 3-card chain counts five points. A 4-card chain counts 10 points. A 5-card chain counts 20 points.

The object of the game is to knock with rummy by making chains. A player may knock with eight or nine cards, including the discard.

After a player has knocked, if the opposing player(s) can place two polluter cards on a chain, that chain does not score.

ACTIVITY 10. (Continued)

Others check the hand. If the player knocked correctly, add up the points. Do not count the points for any chain that has two polluter cards on it. If a player did not have the right to knock, he picks up his cards and the game continues.

If the deck is used up and no player has knocked, turn over the face-up pack and continue.

The winner is the player with the most points when the game is called.

ACTIVITY 11.

View the filmstrips about biomes in the National Geographic ECOLOGY series. Divide class into groups. Each group should conduct research about a different biome. Some biomes are: swamp, woodlands, prairie, pond, desert. Share information with oral reports and drawings.

1) What animals and plants live in the biome?
2) How do the plants and animals interact?
3) What is the future of the biome?

ACTIVITY 12.

Distribute a copy of the game rules and a copy of the food web diagram to each team and have teams play the game.

Materials: Four food web diagrams-one for each community
Four decks of cards
Rule Sheet

The decks of cards to be used in this game can be made by the students. Have teams of 4-6 select a community and decide on the organisms that are to be included in their food web. All decks must contain cards of raw materials, light, and molds, bacteria and yeast.

Students can also make the food web diagrams. This activity will involve some library research to determine eating habits of each animal. This should give the students some background information on producers, consumers, and decomposers which is necessary to play the game.

Prairie Community

3 raw materials
4 light
3 corn
3 wheat
3 Indian grass
6 locusts
3 Quail
3 prairie dogs
3 hawks
3 rattlesnakes
3 humans
4 molds, bacteria, yeasts

ACTIVITY 12: (Continued)

Forest Community

3 raw materials
4 light
3 pine trees with pine cones
2 oak trees and acorns
2 deer
6 beetles
4 rabbits
3 squirrels
2 owls
2 foxes
2 weasels
2 bobcats
4 molds, bacteria, yeasts

Pond Community

3 raw materials
4 light
3 algae
3 pond celery
5 daphnia
5 mayflies
5 beetles
2 frogs
3 turtles
2 minnows
2 bass
4 molds, bacteria, yeasts

Desert Community

3 raw materials
4 light
3 prickley pear cacti
2 saguara cacti
2 sage
6 grasshoppers
3 rabbits
3 desert rats
2 owls
2 roadrunners
3 lizards
3 scorpions
4 molds, bacteria, yeasts

ACTIVITY 12: (Continued)

"COMMUNITIES": A FOOD WEB GAME

Rule Sheet

Each team selects a dealer for the first round. (On the next round of play, the person to the dealer's left becomes the dealer.)

The dealer shuffles the cards and deals five cards face down to each of the other players and to himself. He places the remaining cards face down in the center of the playing area.

The player to the left of the dealer draws the top card from the deck and his six cards that represent one or more complete food chains as shown on the diagram (e.g., Desert Community: sage--grasshoppers--lizards; Prairie Community: corn--humans). He places these face up on the playing area in front of him. No player may play more than one of each population card. (After a card has been placed on the table, it may not be picked up unless there is an error.)

At the end of his turn, a player either holds the remaining cards in his hand or discards one card by placing it face up next to the deck. He then tells the person to his left that he is finished.

The next player draws a card and plays if he can. (A player may draw either the top card from the deck, the top card from the discard pile, or the entire discard pile.)

Play continues as each player adds population cards to the cards on his playing area. Each time a card is added, it must connect directly to a good chain. (In the Desert Community, for example, if a player has put down sage, grasshoppers, and lizards, he may add roadrunners or both desert rats and owls to form a food web. The addition of these populations is permissable because there is a good supply for each animal.)

The round of play ends when one player has a community (at least one food web and a Light card, Raw materials card, and Molds-Bacteria-Yeasts card) on the playing area and no cards remaining in his hand. He then says "I am out" to the other players. The other players can check his cards to see that every card was played correctly.

Each child's score is calculated and recorded. Then the next round can begin.

Scoring: For each card a child has on the table, he receives one point. Unplayed cards are not counted. The player who goes out gets three additional points. One child on each team should record the scores.

ACTIVITY 13.

Making rubbings of objects is a popular and enjoyable art form. It involves placing paper over an object to be rubbed, then moving a crayon or piece of chalk back and forth over the paper so that an image is formed. Have students make rubbings of textures found in the woods. Let them make a collection of rubbings from leaves of different kinds of trees.

ACTIVITY 14.

Take students on a silent walk through the woods. At a given signal, everyone is required to stop and listen for one minute.

1) How many different sounds can be heard on the trail at the first listening point?
2) How are some sounds like others?
3) How are some sounds different?
4) How many different sounds can be heard at the second listening point?
5) Do some sounds evoke certain emotions?

ACTIVITY 15.

Compose a "touch list" with the students. Include words like rough, slippery, soft, and thorny. Take students outdoors and ask them to find objects in the environment that these words describe.

ACTIVITY 16.

Take students for a walk outdoors and ask them to look for happenings in nature which has meaning for them. Allow them to express their feelings by writing cinquains. Cinquain is a five line poem.

Rules for writing a cinquain. Pronounced (sin-can)

Line 1 - 1 word - subject
2 - 2 words - adjective...words that describe
3 - 3 words - verbs...action words
4 - 4 words - feeling about subject
5 - 1 word - summary, describing the overall feeling

ACTIVITY 17.

Display paintings or pictures of various environments. Discuss them briefly, then ask students to choose one environment that inspires them. Write a paragraph about the environment chosen. It is not necessary to write about the one that pleases; one may want to write about the one that shocks rather than pleases.

ACTIVITY 18.

Take the class to the Santa Fe Zoo. Before the trip, you may want to share the book, Turnabout Night At the Zoo, by Carolyn Lane. (Abingdon Press) The book will make students more aware of desirable and needed conditions for zoo animals. Let students observe the animals in their natural habitats.

1) Which animals were seen?
2) Which animals are native to Florida?
3) What did you observe that shows the interrelationships of plants and animals?
4) If you were an animal, which kind of zoo would you prefer--natural habitat or concrete cells?

ACTIVITY 19.

Share the book, Once There Was A Tree, by Phyllis S. Bush, (Scholastic Book Service) with your class. This book relays an account of the life cycle of a tree and its contribution to the environment.

Take the students to a site that has a tree stump. Explain to students that every living thing has a special history and a story to tell that gives its life meaning. This tree stump has left many factual clues about its life, but many things about its life are unknown. Use the factual clues to help you make inferences about the life of the tree.

1) Do you know what kind of tree this was?
2) How old was this tree when it was cut down?
3) What years seemed to be good years for the tree?
4) Did this tree grow quickly?
5) Are there scars on this stump that tell you this tree suffered from the ravages of forest fire?
6) Can you describe what life was like when this tree was a seedling?
7) What happened in those early years?
8) Was the life of the tree threatened at all?
9) Describe how the tree looked and felt.
10) Who lives in this neighborhood?
11) Were they here during the life of this tree?
12) Who might the tree's best friend have been?
13) How did they come to be such good friends?

ACTIVITY 20.

Take a walk with your class around the school campus. Let students observe the area. Ask students to record their observations.

1) What did they see?
2) What did they wonder about?
3) Which spot or place did they like best?

ACTIVITY 20. (Continued)

4) What did they enjoy most?
5) How did they feel about the landscape?
6) How did they feel about the wildlife?
7) How did they feel about the sky or horizon?
8) What did they experience?
9) What did they learn about the outdoor walk?

ACTIVITY 21.

This activity involves predicting what will happen when an ecosystem is threatened. You will need a ball of twine and index cards for names of individual members of a food chain or food web and the sun.

Procedure: Each person should take a card with the name of a plant or animal on it for a particular food chain.

Take one end of a piece of twine and connect the predator-preys, beginning with the primary producer and extending it to the last consumer.

Remove one member in the chain.

Ask:

1) What will happen to the rest of the organisms in the food chain?
2) What could this do to the balance of nature?
3) What would happen in a forest ecosystem if the amount of sunlight was reduced?

ACTIVITY 22.

Write and put together (using art work, pictures from National Geographic, National Wildlife, etc.) a book which could be used to provide a very basic introduction to the idea of interrelationships or interdependency in nature to primary school children (grades K-3). Make the book as artistic as possible--with the text preferably in poetic language (though not necessarily rhyming) and/or in story form.

ACTIVITY 23.

This survey will enable students to see ways man has affected the environment. Give each student a copy of the environment worksheet. They may want to complete it individually or as a small group. A walk around the community will help them to record accurate information.

ACTIVITY 23. (Continued)

ENVIRONMENT WORKSHEET

THE NEIGHBORHOOD

Businesses

___ offices
___ stores
___ factories
___ other (describe)

Public Buildings

___ library
___ church
___ health center
___ police or fire station
___ other (describe)

___ signs and billboards
___ markings on buildings
___ empty lots
___ damage to buildings
___ trash or litter (describe)

BUILDING MATERIALS OF THE CITY

Location or Use

___ brick or tile
___ stone
___ cement, concrete, stucco
___ wood
___ metal
___ glass
___ tar or blacktop
___ paint

Traffic

Stand in one spot for five minutes. Make a count of each of the following that you see.

___ people
___ cars
___ trucks
___ other (airplanes, motorcycles, horses, etc. - describe)

SOIL

Look at the bare ground nearest the school building. Describe it.

Take the temperature

___ 2 inches above ground ___ at the surface ___ 2 inches below ground

Pour some water on the ground. Does the water sink in

___ quickly ___ slowly ___ not at all?

ANIMALS

Mammals

___ dogs
___ cats
___ squirrels
___ rats or mice
___ other (name)

Birds

___ sparrows
___ starlings
___ pigeons
___ gulls
___ robins
___ other (name)

Invertebrates

___ ants
___ caterpillars
___ roaches
___ flies
___ moths or butterflies
___ beetles
___ spiders
___ worms
___ other (name)

ACTIVITY 23. (Continued)

ANIMALS (Continued)

Animal Signs

___ droppings
___ feathers
___ nests
___ paw prints
___ other (describe)

PLANTS

Kinds of Plants

___ trees
___ shrubs
___ grass and herbs
___ mosses

Where Plants Grow

___ on the lawn
___ close to buildings
___ in sidewalk cracks
___ near the curb
___ around poles
___ in vacant lots
___ in the park
___ in people's yards
___ in window boxes
___ other (name)

OBJECTIVE:

To analyze how the population balance is maintained within specified communities and ecosystems.

ACTIVITY 1:

An aspect of an outdoor animal study that promotes group interest and involvement is reading animal tracks and preserving them in plaster.

Begin by having the group discuss where they are likely to find tracks. Generally, more tracks will be found in a particular location, such as along the river. Animal trackers should realize that upon discovering tracks, care should be given so that none are damaged.

1) How long is the track?

2) How wide is the track?

3) How many toes on a forefoot?

4) How many toes on a hindfoot?

5) Is the track fresh or old?

6) What direction was the animal traveling?

7) Was the animal walking or running?

8) Does the animal continue at same speed?

9) What other signs of the animal are there?

10) What are the feet adapted for (climbing, grasping, running)?

11) What kind of food would this animal eat?

After the group has made a thorough investigation of the tracks, each individual should have an opportunity to take home a souvenir track.

Preserving the Tracks (Plaster Casting)

Equipment Needed: (group of 8 or 10)

3 tin cans (#10 size) with plastic tops.

Construction paper, strips of file folders, etc., cut in strips about 1½ inch wide to make collars.

10 paper clips

Select track and position a strip of construction paper around it making sure the collar is tight to the ground so plaster will not seep out.

Pour plaster (#10 size can holds enough plaster for about 10 tracks) into mixing cans, then add water and stir until it reaches the con-

ACTIVITY 1: (Continued)

sistency of pancake batter. Be careful that too much water is not added since you will have a limited amount of plaster in the field with you (ratio - - approximately two parts plaster to one part water).

Quickly mix and pour into tracks (the plaster will begin to set within a few short minutes).

Before the plaster is completely hard, shape a paper clip to serve as a hanging hook and secure into back of plaster.

After plaster has hardened (1 - 3 hours), remove slowly and clean off collar, disposing of paper in empty can.

Clean the cast with a paper clip or an old brush.

Mounting the cast to backing board makes an attractive decoration.

Tips:

Casting of leaves and flowers may be painted with poster paints or oil paints.

Talcum powder sprinkled on the track will keep the cast from retaining sand or mud.

Salt may be added to the mixture to hasten setting, vinegar to slow down hardening.

ACTIVITY 2:

Have students view "Prowlers of the Everglades" and/or "Nature's Half Acre" (Walt Disney films). Both films illustrate the process of checks and balances in nature and show how population balance is maintained. Films are available through Learning Resources Center.

ACTIVITY 3:

After viewing several films and looking through a number of books and magazines, select an extinct or endangered animal to study on your own. Try to find as much information on the animal as you can. Go to the libraries, interview your parents and others who might be able to help. Put all this information into a box or folder (copy or summarize the information if necessary). Use pamphlet: Florida's Endangered Dozen.

There are a number of extinct and endangered animals, among them:

1) the bald eagle

2) the wolf

3) the tiger

ACTIVITY 3: (Continued)

4) the dodo bird

5) the pelican

6) the loggerhead sea turtle

7) the sea cow or manatee

8) the coyote

Prepare a report on the animal you have chosen to study. Try to answer the following questions:

1) Is your animal extinct or endangered?

2) What were the causes of the animal becoming extinct or endangered?

3) Why wasn't the animal able to change or move in order to survive?

4) Do you think the extinction of this animal is/was inevitable?

5) What would have helped the animal to survive?

Prepare a book on the animal which contains your written report, illustrations clipped from magazines, creative pieces (original drawings, poetry, etc.).

Children should be encouraged to exchange their books at the conclusion of the book-making activity. Perhaps, they can be displayed somewhere in school.

As an alternative to having children develop their own books, have them gather information individually and pool their work in the creation of a class-made book -- a group project for which the teacher can write an "introduction."

ACTIVITY 4:

With your classmates, write and enact a play about extinct and endangered species. The play should feature the various animals which have been studied earlier by you and the rest of your classmates.

ACTIVITY 5:

Discuss how upsetting the balance of nature may affect man. What does the plague mean? Have you ever heard of the Black Plague? How was this epidemic related to an upset in the balance of nature? How was the disease contracted? What was the natural enemy of the rat? Why didn't people have cats where they lived? At that time and place in history,

ACTIVITY 5: (Continued)

what did people associate with cats?

Ask for volunteers to report on the following examples of upsetting the balance of nature:

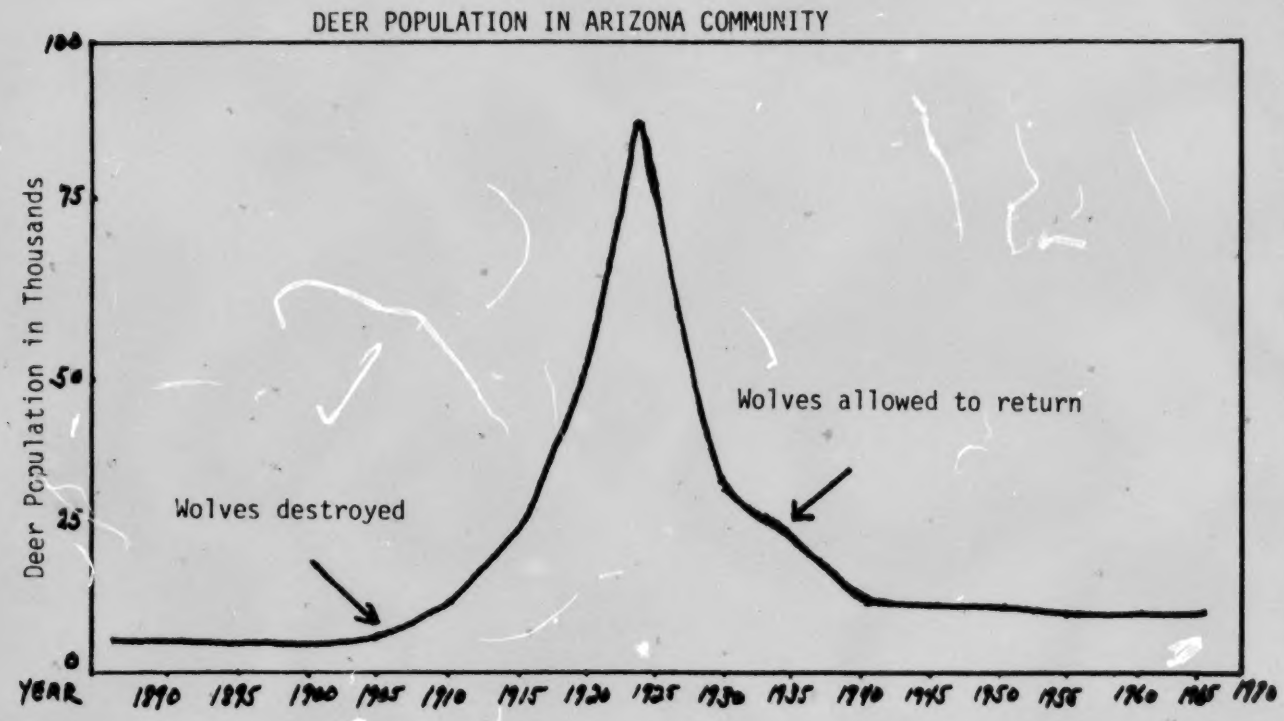
1) Rabbits imported to Australia.

2) English sparrows and starlings brought to America from Europe.

Have you seen evidences in your community of an upset in the balance of nature?

ACTIVITY 6:

Study the graph and answer the questions below.



1) What was the deer population in 1924? Explain the large population.

2) What was happening to the deer in 1930? Why?

3) What happened between 1940 and 1970? Explain. (See Activity 17, page 22.)

ACTIVITY 7:

Discuss with students the effects of environmental factors upon animal populations:

a) food
b) shelter
c) weather and climate
d) disease
e) enemies
f) natural disasters.

ACTIVITY 8:

Let students select an animal and a book about that animal's life cycle. Record how the species factors effect the population of that animal.

1) number of eggs or offspring produced by the female

2) care of eggs or offspring

3) care of the young

4) age of maturing

5) frequency of egg production or birth of offspring

6) length of life

ACTIVITY 9:

Have students make a list of the predators that help to maintain the balance of nature in your community. They should select the one that interests them most and report on it to the class. Some suggestions are: hawks, owls, foxes, bobcats, snakes.

ACTIVITY 10:

Raise a population of a single plant or animal (yeast or paramecium, for example). Estimate the number of individuals in the population each day.

1) Does the number change?

2) Do the numbers increase forever?

3) How can the population growth be limited?

ACTIVITY 11:

Examine population succession in pond water. Sterilize a large-mouth jar. Fill it with boiled water and some dry grass. Cover the jar loosely, and

ACTIVITY 11: (Continued)

store it in a cool place. Each day, examine some water from the jar under the microscope. Record the number of organisms.

1) Does the number appear to change?

2) What food chains are at work in this jar?

ACTIVITY 12:

Study a community (animal, plant, water, etc.) Investigate the area and explain the following:

1) What is population?

2) How many different types of living conditions have you observed?

3) What different types of creatures live in the same community?

4) As the environment changes, do the populations change?

5) Are there any empty niches?

ACTIVITY 13:

Find a dry area and a wet area on or very near campus. Have your students draw pictures of and describe the dominant plants in each of the two areas. Now determine which plants typify wet or damp habitats and which typify dry areas.

1) Did many plants occupy both habitats?

2) How can these plants live in both areas?

3) Why are plants adapted to specific areas?

4) Do you think your lists of plants would allow you to distinguish wet areas and dry areas?

5) What would happen to the plants in the wet areas if we dug a ditch and drained that area? Would the area look different in a few years?

6) How do man's large drainage ditches affect the plants in an area?

7) Would a change in vegetation cause a change in the animals?

Hint: Red-cockaded woodpeckers need dying pine trees to make their nest holes and pine trees grow in dry areas.

ACTIVITY 14:

Demonstrate crowding stresses in roach populations. Materials: 1 gallon jar, unlimited food supply (bread, sugar, etc.) Roaches.

Place the roaches in a jar and give them an unlimited food and water supply. Have students observe the population growth. Graph the population increase. Note at what point the population stabilizes. (Alter the variables of water or temperature and graph their critical thresholds.)

Have students determine the critical thresholds of temperature, of food supply, of space, and water.

ACTIVITY 15:

Have pupils list ways animals and plants are adapted to:

- Cold conditions
- Dry conditions
- Self-protection
- Food supply
- Light

Have pupils select for detailed study the adaptations of several plants and animals. The group could prepare a list to include:

Polar Bear	Venus Fly Trap
Porcupine	Cactus
Skunk	Dandelion
Chameleon	Sand Spur
Opossum	Beggar Lice
Woodpecker	Poison Ivy
Praying Mantis	

Answer the following questions about the plants and animals that the student selects.

1) Why does the organism have these specific characteristics?

2) Have they always had these characteristics?

3) Why is it that all the plants and animals that live in this environment do not have the same characteristics?

ACTIVITY 16:

Students are taken to the schoolyard where they observe and make notes on the following, as realted to succession.

Trees: Types - Size

Compare those planted to trees having grown naturally.

Locations:

1) Do you see small trees growing in flower beds?

2) What will happen if they are not removed?

ACTIVITY 16: (Continued)

What do you find growing under trees?

Shrubs:

Types - Size - Where growing? Why?

Account for growth of those not transplanted.

Hedge:

Type - Do you see plants growing in it? Why? Why not?

How does growth here show succession?

Flower beds:

Note growth of small trees, weeds, and grass in beds.
What would happen here if growth were uncontrolled?

Compare uncontrolled growth here to controlling succession in the field.

Relate controlling growth here to controlling succession in forests.

Lawn:

Observe the growth of weeds.

Compare growth in undisturbed areas to the cared-for areas studied.

1) What is the effect of weeds on the appearance of an area?

2) What are the soil-holding abilities of the weeds?

Cracks in sidewalk or asphalt:

Observe growth of grass and weeds.
Observe soil accumulation around plant roots. Ask: Would soil ever cover an old sidewalk? (Look for abandoned walks in town.)

Discuss and justify the following statements:

Succession will help to determine the wildlife of a community.
An unkept flower bed being overtaken by weeds illustrates succession.
Succession is beneficial to plants, soil, water, wildlife, and man.
Relate succession in the schoolyard to succession on uncultivated fields, sand dunes, bare rocks, or other desired areas.
Relate limiting factors of the environment to succession in the schoolyard.
List and discuss the various stages of succession as seen in the schoolyard.
How would disasters such as fire and storm affect succession?
How does a study of succession in the schoolyard show the importance of controlling succession in a forest?
How does succession affect the balance of nature in a community?
Is a climax stable, or does it constantly change? Why?

ACTIVITY 17:

Write the word "predator" on the board. What is a predator? Are they good or bad? Why? Do you think they are necessary in the balance of nature? What is the balance of nature? As an aid to further understanding of the balance of nature, read the story of the Kaibab Forest. Put on the board and discuss with class this grouping of living things.

Producers - green plants (largest group).

Consumers - depend on producers; (a) herbivores, (b) carnivores, (c) omnivores

Decomposers - get food from nonliving organisms.

THE KAIBAB FOREST

Insects, disease, and fire are natural disturbers of the forest succession. But in the past few hundred years a new disturbance, civilized man, has intruded in the forests of North America and in this brief time has changed them more rapidly than all the other forces of nature combined. Not only has modern man affected the forest by the obvious means of clearing, logging, and burning, but his effect has been more subtle in altering the invisible bonds between living things. Examples of injudicious tampering with the forest community are many -- and well known, because they usually ended in well-publicized disasters. But they are best illustrated by what happened many years ago in the Kaibab forest of northern Arizona, when an attempt was made to redesign and improve on the well-knit fabric of forest life.

Before it was tampered with, the Kaibab was a storybook forest of ponderosa pine, Douglas fir, white fir, blue and Engelmann spruce. One visitor described it glowingly in 1882, "We, who through successive summers have wandered through its forests and parks, have come to regard it as the most enchanting region it has ever been our privilege to visit." It was also the home of the Rocky Mountain mule deer and a hunting ground for Indians, who gathered every autumn and killed deer for meat and to obtain skins for winter clothing and trading. The forest also supported a population of mountain lions, coyotes, and timber wolves that kept the deer population within bounds.

Then, in 1906, President Theodore Roosevelt decreed that the Kaibab be made a national game preserve. In order to build up the herds, deer hunting was prohibited in the preserve and government hunters set about systematically eliminating the predators upon the deer. Within the next 25 years, the deer's natural enemies were virtually eradicated - at least 6,250 mountain lions, coyotes, wolves, and bobcats were killed. Before the vermin-control program began, there were about 4,000 deer in the Kaibab. Within a dozen years, the supervisor warned that the supply of small trees, shrubs, and saplings they used as food were declining.

Scant attention was paid to the warnings, since obviously an increase in deer numbers was what had been intended by the predator-eradication program. By 1924, the deer herds had increased fantastically; some estimates put them near 100,000. That was the high point of the deer. They were now threatened with mass starvation, having eaten nearly every plant and tree they could reach. From then on the population collapsed. A contemporary account reported that deer perished by the thousands and "those that lived ate every leaf and twig until the whole country looked as though a swarm of locusts had swept through

ACTIVITY 17: (Continued)

it, leaving the whole range (except for the taller shrubs and trees) torn, gray, stripped, and dying." Hunting of deer was permitted once again, and although it caused a slight decrease in deer numbers, most of the decrease resulted from starvation and disease, which killed about 60% of the deer herd in two winters. By 1930, the herd had plummeted to about 20,000 animals. By 1942, it was down to 8,000.

Witness the results of 35 years of unwise tampering with the Kaibab: in 1906 it was a relatively stable community of life that supported a healthy population of about 4,000 deer in addition to those killed by the Indians, settlers, and predatory animals. By 1942, there were 8,000 sickly deer and bonds of the forest had been shattered. Certain plant species, such as willows, and raspberries had virtually been eradicated by the deer.

Growth of young aspen had been halted over a period of almost 20 years; in some sections all reproduction of cliff rose had stopped during this period; the vast majority of the firs, spruces, and pines had suffered severe damage. By thinning out the trees and shrubs, the deer had favored the growth of certain grasses and herbs which they do not usually select for food; these plants were also aided by the increase of space in which to grow, and by the decrease of shade and root competition from the species the deer did browse. As a result, the forest composition changed in favor of the grasses and one authority stated that if the deer had remained numerous, the area might have changed from a woodland to a tree-dotted grassland, held in this sub-climax state by the browsing animals.

The Kaibab is a striking example of the folly of working against natural principles of the forest, instead of with them -- as has been done at Isle Royale National Park in Lake Superior. Moose arrived there in 1912, probably having swum from Canada. Conditions were ideal and they multiplied to a population of over 1,500,overbrowsing the woods to the point where they became so weakened that their numbers plummeted to only a few hundred by the mid 1930's. As the young trees began to grow again, the moose herd built up once more. But then, in the late 1940's, wolves arrived on the island, probably crossing the ice in winter. For the past several years, the moose numbers have become stabilized at about 600, despite the birth of approximately 160 young each year. That is because the wolves cull out an equal number of aged and sick moose. Because man did not interfere with the intricate predator-prey relationships of this forest, a balance has been achieved. The moose herd remains stable in numbers; well fed and healthy; the wolf predators have a constant food supply and even seem to maintain a balance of their own numbers; the forest supports both predator and prey, renews itself, and is in better condition than it was before the wolves arrived. (See Activity 6, page 16.)

ACTIVITY 18:

"Wanted - Dead or Alive." Such signs are to be found throughout the United States. However, they no longer apply to outlaws. Instead, they are aimed at certain animals that some men believe should be eliminated. These include such animals as wolves, coyotes, hawks, and mountain lions. Because these predators sometimes feed upon man's livestock, they have a "price on their head" in many states. Should these predators be killed? What happens when these animals are eliminated? This excursion will help

ACTIVITY 18: (Continued)

you answer these questions.

Once occupied by buffalo and sage hens, this region now supports cattle and chickens. The coyote and some other carnivores (meat eaters) have shifted their feeding habits to include the new domestic organisms. Farmers and ranchers claim that millions of dollars worth of livestock are destroyed annually by coyotes.

Supporters of the coyotes don't question the fact that they kill livestock. However, they suggest that the coyotes do more good than harm by eating large numbers of rodents. Because of this coyotes help keep the population of these smaller plant-eating animals under control.

When rabbits or rodents are common, coyotes may not eat all of every one they kill. When rabbits or rodents are scarce, however, coyotes usually consume all of each catch. It is estimated that a coyote eats about 125 cottontails and 15 jackrabbits a year. The coyote may indeed save grass for the rancher's animals, because each rabbit would otherwise be eating the grass that cattle or sheep might eat.

Some estimates comparing the amount of plant material eaten by rabbits, cows, and sheep are shown below:

	Number of Rabbits it Takes to Eat as Much as:	
	One Cow	One Sheep
Jackrabbits	75	15
Cottontails	250	50

1) How many cows could be fed on the grass that each coyote saves when he eats his year's diet of cottontails? His year's diet of jackrabbits?

Suppose a region has a population of 25,000 coyotes and an ample supply of rabbits.

2) How many cottontails would 25,000 coyotes eat annually? How many jackrabbits?

3) How many additional sheep could graze on the grass saved by the coyote? (Assume only sheep are raised in the region.)

4) If only cattle were raised in the region, how many additional cows could be fed by the grass saved by the coyotes?

Coyotes do a good job of controlling the population of rabbits and rodents. Without the coyote, these populations would be likely to increase at a high rate.

ACTIVITY 18: (Continued)

5) How would such an increase affect the amount of grazing land needed to nourish a cow?

6) Suppose it costs about $25.00 per cow each year to provide grazing. How much money could 25,000 coyotes save ranchers each year for cattle in the region being studied?

ACTIVITY 19:

Invite a wildlife officer from the Florida Freshwater Fish & Game Commission to speak to your class. Before his visit, discuss causes of radical changes in wildlife populations. Explain that intensive farming, heavy industrialization and trememdous increases in population destroy natural habitats. Yet early settlers in this country found wild game an unlimited resource and in some cases, a pest. At one time, all hawks and owls were considered enemies to the forest and to the farmer. They have been found to be effective in the control of mice and rats and are now protected by law in some states.

1) Why is it necessary to change game laws from time to time?

2) How are certain species of animals protected by law?

3) Which animals are protected?

4) What are hunting season regulations?

OBJECTIVE :

To recognize the interdependency of man and to identify and explore the effects of human behavior as it relates to others.

ACTIVITY 1:

Have students visit a large produce market. Students should ask: Which produce is available locally and when? Which produce comes from out of state? What items become unavailable due to cost of transportation?

ACTIVITY 2:

Ask students to list all the foods each consumes for a three-day period. The students should determine the origin of each of the food items by reading the labels and cartons. Then the student should locate the origin of each of the products on a map.

ACTIVITY 3:

Invite a building contractor to speak to the class or assign a group of students to interview him. Choose one model home and make a list of the building materials used. Which materials are manufactured locally? Which ones must be shipped from other states? Contrast this home with a "Cracker" home.

ACTIVITY 4:

Ask students to select clothing items they need or want to buy. Analyze the types of resources needed to make the article. List them in the following categories:

Raw materials, just as they come from the animal or plant, or out of the ground.
Basic processed materials, made from raw materials, and used in many products.
Capital resources, such as land, buildings, machines, tools, and equipment needed for production of the article.
Human resources, such as the time, knowledge, skill, and experience of those actually making the product. Also consider those who manage or plan the production.

Students should try to find out the money cost of some resources needed to produce the article. Ask students whether they would care to try making the article from "scratch," beginning with the raw material. Would this be an efficient use of resources, including time?

ACTIVITY 5:

Unequal Resources is a word association game to supplement geographical studies. After students have some experience using maps that show distribution of natural resources, remind students that human and capital resources are also distributed unevenly.

Give students a list of the 50 states. Ask them to list the products, goods, or services that come to mind when they think of each state. After a specified time, stop the activity.

Ask students to examine their lists and to refer to maps and reference materials to correct erroneous associations.

Allow each student to choose a state and investigate reasons a certain product became a specialty of his state.

ACTIVITY 6:

An Experiment in Cooperation: Cooperation Squares Game

The purpose of this activity is to allow students to become more sensitive to how one's behavior may help or hinder group problem solving.

Each person should have an envelope containing pieces for forming squares. At the signal, the task of the group is to form five squares of equal size. The task is not complete until everyone has before him a perfect square and all the squares are of the same size.

These are the rules:

1) No member may speak.
2) No member may ask for a card or in any way signal that he wants one.
3) Members may give cards to others.

Before class, prepare a set of squares. Divide the class into groups of five and seat each group at a table equipped with a set of envelopes and an instruction sheet. Ask that the envelopes be opened only on signal. Begin the exercise by asking what "cooperation" means. List on the board the requirements for cooperation. Example:

Everyone has to understand the problem.
Everyone needs to believe that he can help.
Instructions need to be clear.
Everyone needs to think of the other person as well as himself.

Describe the experiment as a puzzle that can only be solved with cooperation. Read the instruction aloud, then give the signal to open the envelopes. When most of the groups have finished, call time and discuss the experiment.

A puzzle set consists of five envelopes containing pieces of stiff paper cut into patterns that will form 6" x 6" squares, as shown in the diagram. Several individual combinations will be possible but only one total combination. Cut each square into the parts 'a' through 'j' and lightly pencil

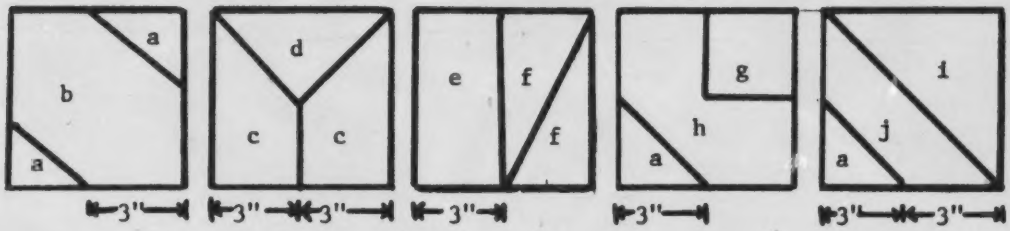
ACTIVITY 6 : (continued)

in the letters. Then mark the envelopes 'A' through 'E' and distribute the pieces thus:

Envelope A-i,h,e
B-a,a,a,c
C-a,j
D-d,f
E-g,b,f,c

Erase the small letters and write instead the envelope letter A through E, so that the pieces can be easily returned for reuse.

By using multiples of three inches, several combinations will form one or two squares. Only one combination will form five 6" x 6" squares.



Ask such questions as:
—How did you feel when someone held a piece and did not see the solution?
—What was your reaction when someone finished his square and then sat back without seeing whether his solution prevented others from solving the problem?
—What were your feelings if you finished your square and then began to realize that you would have to break it up and give away a piece?
—How did you feel about the person who was slow at seeing the solution?
—If you were that person, how did you feel?
—Was there a climate that helped or hindered?

ACTIVITY 7 :

The Kidney Machine is a group problem solving game.

Introduce the students to the strategy by saying: "The kidney machine saves the lives of people suffering from kidney malfunction by hooking them up to the machine one day a week. Many people seek the service of the machine, but only a few can be served. You are on a volunteer committee to decide who should receive the machine's services. The decision must be made on other than medical criteria, since the list of candidates from which you must choose has been screened by doctors and all of the candidates can benefit equally. There is no cost to the patients for the use of the machine.

ACTIVITY 7: (Continued)

"As a committee, you are to discuss, and then determine by consensus, a final ranking of how these people should be assigned to the vacancies on the machine. Then, as a group, prepare a list of criteria that you used in arriving at your final ranking. List the criteria in order from most important to least important."

Patients

1) Glenn-filmmaker; no family; 33 years of age; is thought by some to be one of the best upcoming filmmakers in the business.

2) Rodriques-migrant worker; wife and three-month-old child; 21 years old; wife is crippled.

3) Arch-dentist; wife and three children; 40 years old; very active in his community.

4) Williams-black activist organizer; husband and two children; age 28.

5) Brown-self-employed plumber; wife and twelve children; 43 years old; oldest child is 16

6) Schwartz-secretary in a law firm; single; 22 years old; women's rights organizer.

7) Batt-student at Harvard; single; 21 years old; plans to study medicine; will achieve B.S. with honors.

8) Greene-garage mechanic; wife and four children; 29 years of age; very involved in church work.

9) Allen-housewife; husband and six children; 37 years old; husband is on welfare and drinks heavily.

10) Levin-president of a large business corporation; wife and two children; age 45.

ACTIVITY 8 :

Job Openings is a values clarification activity which puts students in the position of placing people who need jobs. There are nine applicants for one job opening. All of the applicants want and need the job. Students must decide who should get the job by rank ordering the list of applicants.

Applicants

1) An ex-convict trying to go straight. He has been out of prison for over a year and has stayed out of trouble. He has held several jobs during this time, but was fired each time when his bosses found out he spent time in prison. He is becoming frustrated, discouraged and angry.

ACTIVITY 8: (Continued)

2) A 24-year-old Vietnam veteran who was awarded several medals for bravery. He has a low-paying part-time job now, but is highly qualified for this job.

3) A woman whose husband recently died. She has four young children, ages one to six, whom she now must support. She will be getting $200 a month from insurance, but this is not enough to live on.

4) A 60-year-old man who needs this as a second job. His wife has been in the hospital for several months. To continue her treatments, which are expected to continue for seven more months, he needs this job.

5) A former dope addict who has kept away from drugs for eleven months. He is a very serious young man who is determined to do well. He has had trouble finding jobs because of his former addiction, and his psychologist and priest say there is a strong possibility he will return to drugs if he is not employed soon.

6) A highly intelligent Negro who lives in a slum. He needs the job to continue his college education and to help support his brothers and sisters. He wants to become a doctor and help the poor in his neighborhood.

7) A young woman who left her parent's home to try to make it on her own. She has a strong interest in this type of work, and is the best qualified of all the applicants.

8) A recent immigrant to this country who is the father of four. His knowledge of English is poor, and this will probably slow him down on the job at first. But he is a clever and confident person who learns quickly.

9) A physically handicapped person who is looking for a chance to prove himself. He possesses a great deal of determination and courage. His handicap will hurt his performance on the job somewhat.

ACTIVITY 9:

Life Raft is a group decision making activity. Explain the following situation to the class. "You are the survivors of a jumbo jet which has gone down in the Atlantic Ocean. There is only one life raft. It will hold only ten people. You must decide by consensus who will be saved from the passenger list. You have about fifteen minutes before the plane sinks and takes all of you down with it."

Passengers

1) Salesman-56; married; five children ages nine to 17; going to Israel to help with industrial development; a leader in his community.

2) Black Panther Leader-25; single; en route to England to organize Black Panther contingents among oppressed British blacks, and to train cadre for leadership positions in revolution.

ACTIVITY 9: (Continued)

3) Doctor-63; married; three children over 21; gave up lucrative practice because he believes he has discovered a possible cure for leukemia.

4) Women's Liberation Leader-34; single; going to France to address international meeting of advocates of her cause.

5) Stewardess-22; single; former Miss America.

6) Roustabout-47; single; gambler; former ship captain; excellent knowledge of the sea.

7) Musician-41; black; blind; en route to Europe for concert tour.

8) Nun-28; single; specializes in teaching mentally retarded children.

9) Farmer-43; married; on his way to Africa to work with A.I.D.; excellent hunter and fisherman; former Marine with survival training; suffered heart attack two years ago.

10) Student-22; single; going to Sweden to evade draft; is in third year of medical school, planning to practice medicine in ghetto community.

11) Peace Corps Member-24; married; returning to her post and husband after visiting a sick parent; married three months.

12) Nurse-29; single; has entered new profession during the last two years as it seems to be more profitable; four months pregnant.

13) CIA Agent-36; married; two children ages one and two; about to leave government work; has memorized vital information concerning a government overthrow in Algeria.

14) Fugitive-34; single; former Ivy League college professor; escaped from prison where he was serving sentence for sale of dangerous drugs; seeks asylum in foreign country where he will renounce U.S. citizenship.

15) Minister-43; married, no children; a prominent civil rights leader who is going to Europe to receive an award.

16) Teacher-26; single; leave of absence to study in Paris; great writing potential; leader in innovative education projects.

17) Interior Decorator-40; homosexual; reputation as being the best decorator in America.

18) Girl-11; flying to boarding school in France; very wealthy family; crippled from birth.

19) Banker-43; six children, ages 10 to 21; leading John Birch Society member.

20) Widow-73; en route to Italy to fulfill promise to husband that she would visit their old home once more. Trip cost her her life's savings.

ACTIVITY 10

Club Members is a values clarification activity which allows students to examine aspects of human behavior.

Read these instructions to the group. "Below is a list of twenty "types" that could belong to your club or gang. Your task is to arrange them in order of their desirability within your club or gang. Number them starting with one as the most valuable, two as the next most valuable, etc."

Rank	
_____	Bully.
_____	Shoplifter who never gets caught.
_____	Competitive, always wants to be first.
_____	Daydreamer.
_____	Debater, can start arguments over anything.
_____	Constantly questioning authority.
_____	Mediator or peacemaker; two-faced.
_____	Follows all directions, never questions why.
_____	Track star.
_____	Big mouth.
_____	Graffiti writer.
_____	Genius, but boring.
_____	Militant about his race, religion, etc.
_____	Gossipy.
_____	"Action man" who never stops to think.
_____	Radical.
_____	Cheater.
_____	Public and peer pleaser.
_____	Drug pusher.
_____	Fighter, with anything but his hands.

Divide into small groups; compare answers and discuss your reasons.

ACTIVITY 11:

Divide students into small groups. Each group should have someone to record the group's list. Allow students about five minutes to "brainstorm" as many community roles as possible. Make cards for each of the roles. Then each student may take a role card and show how members of the community depend upon his job role.

ACTIVITY 12:

Given pieces of newsprint or butcher paper, paste, scissors, and a huge pile of old magazines, students might do a collage on the theme "Me in Nature". After sharing their Me-charts, students might do a treasure hunt, going out-of-doors to get some items which "are like me" or "remind me of me".

ACTIVITY 13:

Divide your classroom into small groups. Each group is given a piece of the paper with the following words on it: SAD, HAPPY, SICK, ANGRY, SURPRISED, FRIGHTENED, BEAUTIFUL. Each group is instructed to go out-of-doors and find something that (to them) fits with each word. This is a non-competitive activity, so, if a group finds two things which go with ANGRY, they might trade with a group that has two of something they need. (Teachers might substitute words for a repeated use of the activity.)

ACTIVITY 14:

Read the story, then discuss and answer the questions.

Old Dog

Helen saw a boy kick Toby, Joe's dog. "You stop that," Helen screamed, jumping to her feet. "Here, Toby," she called, "come on, boy!" Toby ran whining and crying to Helen. She knelt beside him and hugged him close.

Joe went over to the boy. "What do you think you're doing?" he demanded. He was furious.

"That dog splashed all over me," the boy said. "You'd better make sure he doesn't bother other people!"

"Yeah? Well, we'll see how you like being kicked," Joe threatened.

What do you think Joe should do to the boy who kicked his dog?

The teacher will initiate a class discussion based on the following questions:

1) What emotions are shown?

2) What do you think Joe should do?

3) How would you have reacted?

ACTIVITY 14: (Continued)

4) Why did Joe react this way?

5) Have you had a similar experience? How did you feel? Why?

ACTIVITY 15:

This little game involves students in acting out their emotional response to a variety of environmental situations. Each situation is described on a card which a student draws and then acts out before the class. Following the acting, other students state the emotions which the actor felt. The actor points out the person who came closest to naming the emotion and that person selects a card and acts out his/her feelings.

Rules:

1. Pick a card and read it. Give it to the teacher who will read it to the class.
2. Act out the situation, expressing your feelings.
3. When you are finished, ask the class "How did I feel?".
4. Pick the student who comes closest to your feeling and that person will play the next card.

Situations for game cards:

You are walking in the woods with your uncle when you see Shep, your uncle's dog, with his foot caught in a big, steel leg trap!

You are walking in the forest with your family and you come upon a dead bird!

You have been watering and carefully caring for the window plants in your classroom, but for some reason they are dying.

After a rain, you are walking with friends and Billy suddenly squashes a worm which crawled up on the sidewalk.

You are playing in a park when you see a girl about to shoot at a little bird with her BB gun (air rifle)!

Right in the middle of your reading group, you see a big, black roach running across the floor toward you!

Fire ants are building mounds in your school yard and the school janitor wants to go out and poison them!

You get up one winter morning and look out of your window to see the world covered with snow!

You are eating your lunch with friends, under a tree in your backyard. A spider swings down from a branch right over your head!

You are sitting looking out the window when you see a chameleon--and it changes color right before your eyes!

Oh, my! It is night-time and you can't remember if you fed the fish and plugged in the heater for your classroom aquarium. This was your job!

You walk out to the garden with your mother and discover the first plants just growing up, out from the earth!

You are visiting a friend overnite and cannot get to sleep because of all the noisy trucks and cars on the highway near the house!

ACTIVITY 15: (Continued)

You go with your grandfather to his favorite fishing lake and find litter all over the place -- cans, bottles, old tires, and trash!

You are walking on the beach. Suddenly you come upon a sea turtle. Upon close observation you notice his flippers and head have been cut off.

You are out for a ride in the family car enjoying yourself when suddenly you smell this terrible odor from a big factory!

You are out working in the yard when your brother grabs the neighbor's cat by the tail and swings him around in the air!

ACTIVITY 16:

Describe your feelings about your environment by learning three new words. Now describe or use three new words that someone who doesn't like your environment would use. What three words would someone who liked your environment be likely to use? Share your new words with two friends.

familiar	smoggy	friendly
alive	crowded	modern
active	impersonal	exciting

ACTIVITY 17:

This creative writing activity allows students to make inferences and judgments about man's effect on the environment.

Directions: Write out the completion in at least two or more sentences. It is all right to differ in judgment and inference.

Once there was a great field. At one edge of the field there were trees and bushes and on the other a thin country road that curved about untraveled for many miles.

In the middle of the field there was a tree, a single tree that had been growing for more than a hundred years. It was gnarled and its branches spread in many directions. The children from the neighboring villages would _____

_____

This young man can be seen at any football game. He has a box of popcorn, a package full of wrapped candy, and a coke. He takes a piece of candy out of the wrapper, pops the candy in his mouth and throws the wrapper down on the ground. He finishes his coke and proceeds to "drop" the cup down through the bleachers. This man is _____

_____

ACTIVITY 17: (Continued)

A group of boys were out for an afternoon of fun in the woods. The bet was to see who was the best shot. After two hours the scores showed Johnny in the lead with a total of two doves and a cardinal, dead in the bush. Tommy was second, having shot two crows. Tommy's younger brother, watching this competition thought _____

_____

ACTIVITY 18:

In view of our environment problems, some of the expressions we use may be out of date. For example, on a summer day, people may stop saying, "Hot enough for you?" and ask, "Polluted enough for you?"

Try bringing these expressions up-to-date:

as white as snow

dirt cheap

as free as a bird

sky blue

Make up modern versions of these:

as scarce as _____

as dark as _____

as thick as _____

_____ brown

ACTIVITY 19:

Imagine you live in the country (or a small town). You are talking with some friends about the environment. Here are some things you might be talking about:

soil pollution	sewage treatment	garbage and trash
ugliness	growing population	litter and air pollution
wild animals	wastefulness	wilderness

Imagine you live in a big city. You are talking with some friends about the environment. Here are some things you might be talking about:

open space and green plants	garbage	noise
air pollution	growing population	wild animals
water pollution	pesticides	beauty
paving over the land		

Pick one and tell why you care about it. Or tell how it affects you - or how you affect it. In some cases (open space or wild animals) you might tell how not having it affects you. Be sure to write or talk as a city person.

OBJECTIVE:

To describe the importance of the limited amount of natural resources of the earth and to consider the ramifications of man's decisions for utilizing them.

ACTIVITY I:

Review the meanings of finite and infinite. Explain what the term rationing means. Have the students give personal instances of rationing at school or at home. Have them name 5 things at school that are rationed to them.

Have the students find out when this country has rationed goods. Were the purposes then similar to what they are now? Make a report on rationing. Give the students the following opinion poll.

True or False Student Opinion Poll.

____ 1. Rationing of gasoline will cut down waste.

____ 2. Rationing will be inconvenient for some.

____ 3. Rationing of goods would be an answer to our resource shortage problem even if a large population were not pending.

____ 4. Rationing would distribute goods more evenly.

____ 5. It would be important to know who was responsible for the quota if rationing were in effect.

____ 6. If gasoline is rationed people would drive less.

____ 7. If gasoline is rationed, it would cost more than it would if the distribution were by supply and demand.

____ 8. Rationing should occur only as a last resort.

____ 9. You would not object to getting less resources if everybody else were getting less also.

____ 10. Rationing could be the answer to the energy crisis.

Discuss each question on the poll. Make certain you bring out the idea that rationing will only prolong the inevitable; finite resources must give out sometime. Also bring in the idea that rationing, by prolonging the amount of the available resource, will give us more time to find substitutes for the resource that is running out.

ACTIVITY 2:

Hand out the student activity sheet to each student. The students should take these home and have their parents fill them out. Poll the class on each question and place the results on the chalkboard. Discuss the results of the survey and bring out the purpose during the discussion.

The Price of Groceries:

1) Were you and your family eating more meat one year ago than you are now? Yes No

2) Have you noticed a climb of prices in the supermarkets? Yes No

3) Please give one specific example; Steak Potatoes Canned goods

4) Do you feel that you and your family are eating as much as you were 1 year ago? Yes No

5) About how much more do you spend at the grocery now than you did 1 year ago to get the same amount or even less?

A. $5.00 or less
B. $5.00 - $10.00 more
C. $10.00 - $15.00 more
D. $15.00 - $20.00 more

6) Do you buy the same amount at the grocery or less? A. The same B. Less

7) If you buy less and serve less do you feel that this is lowering your standard of living? Yes No

8) Do you feel the solution to the problem of rising prices is economical, political or ecological?

9) Do you think there is a shortage of anything in this country? Yes No

10) Do you think your family can function just as well on a little less? Yes No

11) Are you supplementing your grocery expenditures by planting a garden? Yes No

12) Do you can or freeze some of your own food? Yes No

The Price of Gasoline and Oil:

1) When you first started to use an automobile, do you remember the cost of a gallon of gas? If so, what was the price?

2) Do you think the recent rise in price is due to economics or inflation, politics or ecology?

ACTIVITY 2: (Continued)

3) How many miles per gallon does your automobile get?

4) Has the recent rise in prices stopped you from using your car or cars as much?

5) What do you feel is a solution to this kind of problem?

ACTIVITY 3:

With student help, develop a list of industries that use tremendous amounts of natural resources. Students will cite such examples as automobile (steel, rubber, copper, lead, etc.) petroleum, electronics, chemical, newsprint, etc. Assign individuals or small groups the task of determining the increasing use of a material such as petroleum, rubber, or paper during the last 50 years or so. If possible, develop graphs to project the anticipated amount required 50 years in the future. Discuss such things as the possibilities of new discoveries, but within a finite system. Do we waste resources? What is "planned obsolescence"? Who profits from it? Who should establish priorities for resource use? Is it possible or desirable to have "prosperity" without an expanding economy?

ACTIVITY 4:

Develop with the students a list of all the major raw materials needed to build an automobile. Have students find the sources (countries) of these materials. On a large outline map of the world which the children have prepared, locate Detroit and the sources of the raw materials. With a small hand-made flag of that country, identify the sources and connect them to Detroit with colored yarn or thread.

Through discussion, examine questions such as: How many countries contribute to a car "made in the U.S.A."? What raw materials needed are in short or plentiful supply? What has happened to the growth in automobile production during the past 10-20 years? What will happen if and when other countries begin making and using as many automobiles as the U.S.A. does now?

ACTIVITY 5:

Have your students make a list of all the construction materials they can identify in the school building. Students should be allowed to wander around the grounds during this activity. Once the list has been completed, students should determine which materials are man-made and which are natural. These lists should be further divided according to industries that supply the materials, and states and countries that provide the materials. What would happen to construction if the supply of one of the materials were cut off? What could be substituted? What materials could be used to make the building more attractive.

ACTIVITY 6:

Divide the class into two large groups. Each group will represent an imaginary country. One country will be called the "United States of Have", and the other country will be the "Republic of Have Not." Each country has the following resources (place on chalkboard):

U.S. of Have	Republic of Have Not
4000 gallons of oil	8000 gallons of oil
2000 bushels of wheat	1000 bushels of wheat

Cut blue construction paper into 20 pieces approximately 2 inches square. Also cut 30 pieces of red construction paper. Obtain 4 shoe-boxes or other containers. Label two of the boxes, "U.S. of Have", and two of the boxes, "Republic of Have Not." Each blue piece of paper represents 100 gallons of oil and each red piece of paper represents 100 bushels of wheat. Place the proper number of papers in each box (40 blue and 20 red pieces in the "U.S. of Have" boxes; 80 blue and 10 red in the "Republic of Have Not" boxes.)

Start the exercise by establishing these standards:

1) Each person in both countries needs 100 bushels of wheat per year.

2) Each person on the "U.S. of Have" needs 200 gallons of oil each year because of the high standard of living. Most of the people have cars, nice homes with lots of electric appliances, and many other luxury items.

3) Each person in the "Republic of Have Not" needs only 50 gallons of oil per year because they do not own luxury items such as cars or nice homes.

4) The population doubles every year in both countries.

Now proceed with the activity:

Have 2 people from <u>each</u> country come forward. They should remove the amount of oil and wheat they would use in one year. Now have 2 more come forward from <u>each</u> country and take their required materials. The original two should also remove another year's worth of oil and wheat.

Thus, two years have passed and the population has doubled. Next, the population doubles again; now a total of 8 people from each country should remove materials. Continue this until all the wheat from one of the countries is gone.

1) Which country ran out of wheat first? (Have nots)

2) Which country was getting close to running out of oil? (Haves)

3) How could the "U.S. of Have" keep its oil longer?

ACTIVITY 6: (Continued)

(Conservation methods; just don't use as much. Stop using cars; don't waste electricity, etc.)

Now replace the paper pieces in their correct boxes.

This time allow students to trade oil for wheat or wheat for oil. Only the new members of the country can bargain each year. For example: The first two students from each country come forward and remove their wheat and oil. They can try to trade oil for wheat or vice versa. Anything traded goes into the supply box for that country. When the next students come forward they remove their items and are now able to trade with the members of the other country. If the "Republic of Have Not" traders decide to give up some of their oil for wheat, then the traded items are placed in the respective containers.

1) How long can the countries survive this way?

2) No matter what is done, as long as the population doubles each year, what happens to the resources? (They run out.)

3) Will we run out of electricity?

4) What can we do to postpone the power crisis?

ACTIVITY 7:

Conduct a small research program on the power crisis.

1) How much petroleum do we have left? When will we run out?

2) When will we run out of natural gas?

ACTIVITY 8:

In a free enterprise society, two basic factors influence the cost of goods. One of these factors is supply: as it rises, prices fall; or as it decreases, prices rise. The second factor is demand: as it increases, prices increase; or as it decreases, prices decrease. These two factors operate simultaneously to influence cost in our economy.

Discuss this with your students and then ask them the following questions:

1) Our food supply is growing slowly while the demand for food is growing rapidly. What do you predict will happen to the price of food? Check with your mother to see if your prediction is accurate.

2) We have exhausted our high grade iron ore and we are now extracting lower grades in the form of taconite. How will this affect the price of cars? How will it affect the price of bicycles? How many things can you think of that will be affected by the decreasing supply of good iron ore? What are some things that we could do to stabilize our supply of steel?

ACTIVITY 8: (Continued)

3) Our supply of petroleum is dwindling while our demand for it is soaring. What will happen to the price of gas and oil? Just before we run out of petroleum, what do you think will happen to the cost? What will happen to the cost of electricity? Why?

4) How many resources or goods can you think of that have a decreasing supply and increasing demand?

5) How will these rises in cost affect your standard of living? Will your dollar buy as many things in the future?

6) How can we help solve our resource problems and maintain our present standard of living?

ACTIVITY 9:

Demonstrate rising costs as resources diminish through the following activity. Relate the activity to the energy industry.

Purchase 4-32 ounce bottles of Coca-Cola and enough very small paper cups for your whole class. Chill the cokes and bring a shot glass to the classroom. Place the cokes on your desk (more enticing if you pack them in ice) and tell the students there is plenty of coke for each student to buy at least three shots. Indicate to the class that the student who buys the most shots will win the game and get an extra 5 shots of coke. Out of scrap paper have the students cut enough 1" squares so that each student will have ten wampum papers. Explain auctions and bidding to your students. When the bidding is over you will want to demonstrate how a free market economy relates to this kind of bidding situations. Have the students bid on the coke one shot at a time. Even though you remind them that they aren't going to get very much coke if they bid the price up in the beginning, a few will probably do this anyway. On the blackboard record the price of each shot and who bought it. As soon as the first bottle of coke is gone remove two of the bottles of coke and explain to the kids that we really didn't have as much coke as we thought. Compare this to the oil industry. Now let the bidding continue on the second bottle. If they wish, small groups of students may give their wampum papers to other students. Typically, the bidding will begin a little high and then decrease through the rest of the first bottle. Bidding should climb during the second bottle and if you let students pool their money, the cost may be very high for the last few shots. Graph the bidding results. Carefully relate this price situation to the prices of our rapidly diminishing energy resources such as oil.

1) Why does the price of an item go up as it becomes scarce? (Since the demand is high people are willing to pay more for an item that is scarce.)

2) How many years of oil reserves do we have left in the U.S.? (In 1973 we had about 9 years of <u>identifiable</u> reserves left.)

3) What will happen to the price of gasoline, electricity, fuel oil and other oil products as the supply dwindles? (Prices will go up.)

ACTIVITY 9: (Continued)

How much will people be willing to pay for the last few thousand gallons? (Hundreds maybe thousands of dollars.)

4) What will happen to your standard of living as the cost of energy rises?

5) Do we waste our energy resources?

6) Is it worthwhile to begin conserving our energy resources now so that we will have inexpensive energy longer?

Inform the students that the U.S. has 9 years of petroleum reserves left (the Alaskan oil will only last two years) and that the world supply is down to 22 years. Remind them that many foreign countries are beginning to restrict our use of their oil. Have the students answer the following questions in a report that they will write on "How the Oil Shortage Will Affect Me."

1) What is going to happen to the price of oil in the next 10 years?

2) Is there anything that won't go up in price as we run low on petroleum? (Remember: Most electricity comes from petroleum and all transportation requires petroleum.)

3) Do you think you will ever own a car? How will you afford to drive it?

4) Will you be able to travel?

5) Do you think man will find an energy substitute that will satisfy our insatiable demands for energy?

6) What will this do to your standard of living?

7) Do you think we should destroy mountain ranges to harvest oil from shale?

8) Since there doesn't seem to be a substitute that will completely replace the energy we get from oil, what do you think we should do with the remaining oil?

ACTIVITY 10:

Have an interested student make a display of various minerals and their uses. Have the students do research on minerals to determine which of the minerals in the collection are becoming scarce. Identify countries which have each mineral in abundance.

ACTIVITY 11:

Secure from the power company small samples of the different sizes of wire used to transmit power in the area. Also secure (2-3 students could do this) information about where the different sizes are used.

ACTIVITY 11: (Continued)

Involve students in determining the weight per unit length (use both English and metric systems) and in getting rough measures of the lengths of transmission wires found in various areas of the community or city. Calculate weight of copper and aluminum used and then extrapolate to estimate the amount used by larger areas or populations.

Discuss briefly some problems of diminishing copper resources and the need for recycling such materials.

ACTIVITY 12:

Have each class member list the renewable and non-renewable resources he or she has consumed in the past 24 hours and identify each as essential to survival, necessary for maintenance of life style, or luxury. List alternatives that would reduce waste of non-renewable resources.

Compile a master list of student responses and discuss interesting data that is produced.

ACTIVITY 13:

Show how many pounds of paper a year your class consumes for schoolwork alone: Estimate how many pads and notebooks you use each school year. Weigh this number of pads and notebooks. (Borrow some from your friends if you don't have the full amount for a year.) Also weigh all your books. Add the weights of those items, and multiply by the number of people in your class. This will give you a rough idea of how much paper your class uses for schoolwork in a year.

ACTIVITY 14:

List all the different paper items that you use (paper for schoolwork, tissues, paper napkins, toilet paper, paper plates, newspapers and magazines, paper cups, writing paper, wrapping paper, cardboard boxes).

Calculate how many trees the students in your school consume in a year. Facts show that about 430 pounds of paper goods are used by one person in a year. Multiply this figure by the number of students in your school to find how many pounds of paper items the students use. Every ton (2,000 pounds) of paper produced requires approximately 17 trees. How many trees do the students in your school use every year?

If the school has 600 students, the paper used annually is 600 x 430 pounds. This equals 129 tons. If 17 trees are used per ton, the students use up 129 x 17, or roughly 2,200 trees a year. This figure is far from precise; the number of trees required per ton of paper varies with the type of tree used and the kind of paper being made.

ACTIVITY 15:

In 1970, the amount of land occupied by the dead (graveyards, cemeteries, and so forth) is equal in size to the state of Connecticut. Yet estimates show that more people are alive today in the U.S. than have ever died in this country. What problems lie ahead for the present methods of burial of the dead? What solution do you suggest and how should it be carried out?

ACTIVITY 16:

Break the class up into 4 groups. In an allotted time period, have each group compile a list of as many resources as they can. Have the captain of the winning group copy their list on the blackboard. Hold a discussion of the resources listed, classifying them as renewable or nonrenewable. Discuss various ways some of the resources could be recycled.

1) Why are some of the renewable resources in danger of becoming nonrenewable?

2) What effect does pollution have on the renewable resources? (Air and water pollution generally slow the ability of the resources to renew themselves.)

3) How does dumping old automobiles in the ocean affect the mineral renewable resources? (We lose the metal to recycling processes.)

ACTIVITY 17:

Resources to be investigated. Make a report on (1) the sponge industry, (2) shrimp industry, (3) game-fish and (4) commercial fish. Ask yourself these questions and include them in your report.

1) Do we have more or less of these than we did 25 years ago?

2) Has man wasted or saved these resources?

3) Has the government regulated use of these resources?

4) Find out through research in your library or by asking someone connected with these industries what will happen to them 10 years from now.

ACTIVITY 18:

Study Britain's dependence on overseas trade, both to supply her needs and to sell her produce. Areas of investigation should include:

1) High cost of living in Great Britain.

2) Periodic rationing of materials.

ACTIVITY 18: (Continued)

3) Low productivity in a highly industrial nation.

4) Effect on diet.

5) Nationalization of hay industries.

6) Preferred position of commonwealth nations' trade with Great Britain.

7) Connection with National Health Program (reduce cost of living).

8) Comparison of cost of living in Great Britain and United States.

9) Periodic outbreaks of inflation in England due to cost of resources.

ACTIVITY 19:

Divide the class into the following groups to represent some of the interests that use water:

10 Homeowners; 5 Motel owners; 3 Restaurant owners; 1 Car-wash owner; 1 Drug Store owner; 2 Department store owners; 1 School Principal; 1 Marina owner; 2 Gas station owners; and 1 Factory owner (if there are more than 27 students, add Homeowners; if there are less than 27 students, appoint fewer Homeowners and Motel owners).

The activity:

Cut 30, 3 x 5 file cards into fourths. Place these pieces in a shoebox or some other container. This container with its cards becomes the city's lake. Label this box "City Lake and Water Supply". Label another box "Sewage Treatment Plant" and a third box should be labeled "Evaporation."

Establish the following rules:

1) All water used by the interests in the city comes from the "City Lake and Water Supply."

2) Each piece of card in the "Lake" is equal to one water unit.

3) Each interest uses the following numbers of water units per year. (Place this on the chalkboard.)

INTERESTS	WATER UNITS USED PER YEAR
Homeowners	1
Motel owners	3
Restaurant owners	2
Car-wash owners	4
Drug Store owner	3
Department store owners	3
School principal	4
Marina owner	2
Gas station owners	3
Factory owner	4

4) Three-fourths of the water used each year ends up in the Sewage Treatment Plant after it has been used by the city interests.

5) One-fourth of the water used each year is lost either by evaporation or in the products produced by the city.

6) Three-fourths of the water in the Sewage Treatment Plant is dumped back into the lake to be re-used, the other one-fourth evaporates.

(The teacher should take care of the Sewage Treatment, Evaporation and Lake boxes.)

7) Homeowners always get their water last.

Now proceed through a normal 1 year water use plan. Each person should remove the number of water units they use per year.

The water units should now be sent to the "Sewage Treatment" box and the "evaporation" box. For example; a homeowner has removed 1 water unit from the lake. He must divide this 1 water unit into 4 equal parts. Three-fourths of his water unit goes into the "Sewage Treatment" box, and one-fourth of the water unit goes to the "Evaporation" box. A second example could be the Factory owner takes 4 water units from the lake. He sends 3 of these to the "Sewage Treatment Plant" and 1 to the "Evaporation" box.

After each student has placed his used water units in the proper boxes, the teacher should remove three-fourths of the water units from the "Sewage Treatment Plant" and place them in the lake.

The other one-fourth from the Sewage Treatment Plant should be placed in the Evaporation box. (For a class of 27 students, the following units would have been used in the following manner: 120 units in lake; 60 units taken out by students, 15 of these units would go to the Evaporation box and 45 of these units to the Sewage Treatment box; 11¼ units from the Sewage Treatment box would go into the Evaporation box. 33 3/4 units from the Sewage Treatment box would go back into the lake.)

Now the teacher should take 1/10 of the units from the Evaporation box and dump them back into the lake as rain. (When doing this, round off the number to the nearest tenth. Thus, with a class of 27 students, there should be 23¼ units left in the Evaporation box at the end of one go around. These units are lost as rain to other areas around the city.

Now establish some changes in the city.

The population of children increases so that the school becomes twice as large, so now it uses twice as much water. More cars are in the city so gas stations and car washes use twice as much water. The marina has increased business so it uses 3 times as much water. Tourists increase in number so the Motels use 3 times as much water and the Restaurants also use 3 times as much water. The Drug stores and department stores are doing more business so they use twice as much water. The Factory

ACTIVITY 19: (Continued)

has to supply more goods to the Department store so it uses 3 times as much water.

Now let each interest take their water units for this new year. Remember, homeowners must go last.

Discussion:

1) Was there enough water to go around? (No)

2) Who suffered most from the lack of water? (Homeowners mainly)

3) During which year did the city interests make more money: year 1 or year 2? (Year 2)

4) Which year did the city interests use more water: year 1 or year 2? (Year 2)

5) Which year did the homeowners use more water? (Neither year, they used the same amount both years.)

6) Without water, what will happen to the business interests? (They will go out of business.)

7) Do you think the city could survive at the water usage levels of the first year? (Yes, but not forever. More water is lost than is returned to the lake, so eventually the lake will not support the city.)

8) Should the city look for another source of water? (Yes)

9) How could the city conserve water?

10) Are we using our water resources in Alachua County wisely?

11) What kinds of water pollution do we have in Alachua County?

12) What can we do about our water pollution problems?

ACTIVITY 20:

Involve students in calculating the amount of water used daily in their a) homes, b) communities, c) state and, d) the United States; a table such as follows might be useful. Selected individuals or small groups might investigate through interviews with key personnel the availability (present and future) of water in the community using survey questions. Finally, discuss the findings with the entire class to determine what they might mean to individuals, industry, government or other groups.

ACTIVITY 20: (Continued)

ESTIMATED WATER CONSUMPTION

SOURCE	POPULATION	USE FACTOR Gal/Person/Day	ESTIMATED DAILY WATER USE (Gals.)
Home		150	
City		150	
State		150	
United States		150	
Total of All Sources		600	

ACTIVITY 21:

Many of man's activities alter the aquatic environment and can cause the destruction of species in a given body of water. The processes of eutrophication cause such changes in the species composition of an area. In this case man speeds up the natural process by introducing excessive fertilizers and human or cattle wastes into a body of water. Obtain 4 gallon jars and fill each of them 1/2 - 3/4 full of pond water. With a sieve, have the students gather enough fish so that each jar will have about 3 fish (mosquito fish or wild guppies work well).

Treat each of the jars as follows:

1) Jar #1 should be set aside as a control.

2) To jar #2 add one tablespoon of some common lawn or garden fertilizer.

3) To jar #3 add two tablespoons of animal waste.

4) To jar #4 add a tablespoon of laundry detergent.

Discuss:

1) What changes do you observe in the behavior of the fish?

2) Why did some of the fish die? What was the cause of death? (Usually it is the lack of oxygen.) (You may wish to remove the fish before it dies.)

3) What species are taking over in the jars and thereby replacing the

ACTIVITY 21: (Continued)

fish? (Bacteria, algae, etc.) Do you think it would be as much fun to fish for bacteria as it is to fish for bass?

4) When eutrophication occurs are the species that replace the old species as desirable to man as the former species?

ACTIVITY 22:

During a 4 week period, have the students bring to class newspaper articles dealing with examples of how man has changed an environment. Remember any change will alter an area's suitability for some species. As the articles come in, expand on them and use some of them as take-offs for developing environmental concepts. Examples of articles relating to this topic would be: development, pesticide use, pollution, channelization of a river, dredging, etc.

ACTIVITY 23:

Have the students prepare, through research, a list of the species (aquatic, birds, mammals, reptiles, etc.) that were probably present before Disneyworld was developed. Have them prepare a second list of those that are present now and their relative numbers.

1) How did man alter this environment?

2) What changes did he cause to reduce the chances of survival of some of the species?

3) Do you think man could alter the environment to such an extent that even he couldn't survive?

ACTIVITY 24:

Students should study the structure of the local agency of government (county, town, city, village). Make a chart of the duties the officials perform. They should be aware of the presence or absence of a responsible program for safeguarding our resources. Each student should write an article (the best ones, chosen by the class, could be printed in the school newspaper) answering the following:

1) Who is responsible for environmental planning?

2) Is this his only task? How many others does he have?

3) Should the government have a Director of environmental planning? Why?

Interested students may want to research the State and Federal function.

4) What kinds of legislation are being recommended to safeguard our resources?

5) What groups support such legislation? What groups oppose it?

ACTIVITY 24: (Continued)

6) What is the effectiveness of the legislative approach to solving our resource problems?

ACTIVITY 25:

Take a survey in your community regarding people's feelings about resources, their importance, what types of controls should be adhered to, what the government's role should be, whether the community is doing its part, etc. Compile the results and ask to present them at a city council meeting under the direction of your teacher.

SEVENTH GRADE

OBJECTIVE:

To recognize that the potential for physical, mental, emotional and social growth and development is established by heredity and environment.

The environment plays a major role in shaping the hereditary character of any population by sorting out those least fit to adapt to the prevailing environment. An organism whose genetic make-up does not allow it to live, feed, reproduce, or compete with others in the environment, will not be able to pass its genetic characteristics to a future generation.

On the other hand, animals and plants may alter the environment of an area to such an extent that the prevailing environment is changed, thereby, ultimately reshaping the hereditary characteristics of those who live there. Thus, heredity and environment are closely interrelated.

ACTIVITY 1:

The basic needs of men and animals seem to be approximately the same. These needs include a suitable living area, freedom from stress, territory, and reproductive process. Have students consider the plight of a caged animal. Few animals readily adapt to this condition. Some reference study or a visit to Reptile Land or Santa Fe Zoo will reinforce this understanding.

Discuss a "caged man". Such things as job pressures, tenement housing, crowded freeways, busy shopping centers, and overused recreation areas may serve to trap a human being.

1) What other factors can you think of which tend to "cage" man?

ACTIVITY 2:

Tolerances to environmental factors can be easily determined in an aquatic environment with organisms such as fish. Their end stress points can be determined by counting gill beats or through observation of their swimming behavior. Set up an experimental situation to determine their tolerances to temperature, salt or other factors.

1) Is it important to know the tolerance limits of various animals? How can this information be used?

2) Do you think that an organism's temperature tolerance would be as great if you stressed it with salt?

3) How has man been able to survive in areas that are beyond his tolerance limits?

ACTIVITY 3:

Discuss the factors which influence an animal in its selection of its home territory.

1) Do human beings consider the same things when seeking a place to live?

2) Is the environment compatible with the needs of man? Explain.

3) What adjustments or avenues of escape, that lower animals cannot make or use, can man exercise to ensure his well-being and survival?

4) How do rural, suburban and urban environments each suit or thwart the needs of men?

ACTIVITY 4:

Read the story Call of the Wild by Jack London. This story is about an Alaskan sled dog and how he adapts from one environment to another when he has a change of masters - a good example of "Survival of the Fittest".

1) What do people mean when they talk about "Survival of the Fittest"?

2) In our previous draft laws, why did we draft the "fittest" to be killed and leave the remainder to reproduce?

ACTIVITY 5:

Divide the class into small groups. Each group will be responsible for administering a survey poll of other students in their school. The results of these surveys can be expressed by means of bar or line graphs. The survey poll should answer the following questions:

1) How many students would rather live in a house with a yard in a subdivision or in an apartment or condominium?

2) How many students would rather live in a subdivision or on a small ranch or ranchette of about 4 acres?

3) How many students believe they could grow their own gardens and produce the majority of their own food if they had garden space available?

4) How many students get nervous or feel like somebody is watching them when they are walking on a crowded street, shopping plaza, or in the mall?

5) How many students get nervous when they have to speak in front of a group?

6. How many students believe they could break the law or do bad things if they were very nervous or panic stricken?

The students should design a method of keeping their data so that it can be placed on a graph. Discuss the results.

ACTIVITY 5: (Continued)

What are the implied effects of a crowded environment on the psychological and sociological development of man?

ACTIVITY 6:

Living things have evolved with adaptations to a specific environment and this limits their distribution.

Find out how man's development, and housing patterns have influenced the distribution and survival of the following:

1) alligators

2) pelicans

3) poisonous snakes (e.g., rattlesnakes)

How have man's development activities affected the habitats to which these organisms are adapted?

ACTIVITY 7:

Animals are grouped according to their environment. Take the following environments and find out what animals live in each. Also describe how each animal has adapted to his specific surroundings.

Areas:	Mountains	Deserts
	Grasslands	Polar regions
	Woodlands	Oceans
	Tropical forests	

Have students make a large world map and cut out figures of the various animals they research. Place the animals in an unnatural environment and describe how they would have to adapt in order to survive.

1) Do the students believe that they could survive or would they finally die off? Would the polar bears survive or die off?

2) What do they feel would be the reason if the bears died off?

This exercise can be completed as a small group assignment or as an individual assignment.

ACTIVITY 8:

Find pictures of the following: polar bear, camel, alligator, coral, penguin, seal, salmon, gila monster, rhinocerous, elephant, and giraffe. Divide the class into two teams. Each team gets 1 point for a correct placement of the animal on a world globe. (Use tape on back of picture.) If one team fails to place it correctly, the other team gets an opportunity to try. A team may challenge the placement by their opponent. Two points are awarded to the team that can give sufficient reasons why the animal lives there and how he evolved to fit his environment. Conduct the same activity using trees and vegetation. (Example: oranges, avocados, apples, peaches, coconuts, palms, sagebrush, birch, douglas fir, redwoods, cactus, creosote bush, mesquite, etc.) For the two point bonus question, have students tell how the plant lives in its environment and why some require cold temperatures in order to reproduce and some do not. If pictures of the various species mentioned cannot be found, have students draw and color pictures of them.

ACTIVITY 9:

Organisms are adapted to live in a particular habitat with specific tolerance limits. Those unable to adapt to change in the environment may become stressed to the point of extinction.

1) How does this statement relate to people who have moved from urban areas to the country, and those that have left the country for the city life?

2) How has technology effected the health of our people and also the health of the land.

ACTIVITY 10:

Have a panel discussion on man's need for a "natural" environment. The main concept is mankind's genetic makeup being shaped by evolution to require "natural" surroundings for optimum mental health. The leader of the panel could monitor a discussion on the following topics:

1) Man is best adapted to a tropical savana, but as a cultural animal we have adapted to cities.

2) In our homes, we try to imitate climate and a natural setting: warm, humid air; green plants; animal companions; green houses; and a swimming pool. If possible, many people buy houses in the country or take their children to the seashore.

3) Man has positive physiological reactions to a natural setting and diversity and to the shapes and colors of nature (especially for green).

Questions to ask:

1) Is man separated from the natural world by technology?

2) How is modern man like a wild animal, spending its life in a zoo? (He is fed abundantly and protected from natural dangers, but deprived of the natural stimuli essential for many functions of his body and his mind.)

ACTIVITY 11:

To help students to become aware of and appreciate beauty as an important dimension in man's life, define happiness with the class, directing the discussion to emphasize that enjoyment varies with the individual.

1) How can we preserve these special moments or places for others to appreciate?

2) Why is it important to recognize beauty?

3) How may beauty be expressed?

4) Do you think it is important to share your feeling for beauty?

5) What experiences take place outdoors that cannot be enjoyed elsewhere?

Plan a trip outdoors - a "soft shoe" walk. A "soft shoe" walk is a good method for experiencing the sounds of the forest. Signal the students at various times that "soft shoe" conditions are in effect. At this time, no sounds or talking shall be heard. The walk can continue with appropriate stop signals by the teacher or leader when distinct natural sounds are heard.

1) How could you share with each other something that expresses beauty?

Make a class book - Ten Beautiful Things. Suggest that each pupil be responsible for one page. Each page should contain ten ideas illustrated by pictures or sentence pictures. Compile all to form the book.

Encourage students to make collections at home - wood, fallen branches, fallen leaves, seeds, nuts, feathers, etc. They may want to keep charts or records showing what, where, etc.

1) How do the values of a good friend affect your values?

2) How are respect for nature and self-respect related?

3) In what ways is an appreciation of the beauty in the outdoors important to our well-being? (More leisure time, increasing vacations, shorter working hours, higher income, tensions due to business and industry, home environment changes)

4) In what ways is an appreciation of the beauty of nature important for our well-being in the future? (Provides recreation, healthful physical and mental use of leisure time for everyone; develop appreciation of spiritual, aesthetic, and cultural values; provides employment; attracts tourists; protects the outdoors against misuse, vandalism, carelessness, fire, erosion; creates interest in conservation)

ACTIVITY 12:

Take your class outdoors and give them the following assignment. Tell the class that they are from a planet in another solar system. You have just landed your space ship and are now looking around this new environment. Your commander is asking you to report what you see. Remember that your commander has never seen such things as trees, grass, people, sidewalks, cars, buildings, etc. Create a story telling what you see, hear, and feel.

ACTIVITY 13:

Have students make a list of things that appeal to them and that are pleasant to look at as they look out the window. In contrast, have them list things that aren't pleasant to view, and that don't give them a good feeling, giving reasons for these feelings.

If on the way to school they can remember something that "turned them off", or made them feel down, have them express why they think it did. For example, if you saw a cat that had been run over, how did you feel? Have a class discussion on these things, and try to direct their thinking to the differences in environments where people live. In a crowded environment, stress the probability of the occurrence of unpleasant, unhealthy (both mentally and physically) and unnatural conditions which make for unhappy, apathetic people. How do these things influence their life and career opportunities?

ACTIVITY 14:

The environment determines the kind of plants that will grow in a specific area.

Select 2 sets of plants that live in different environments, e.g., swamp plants vs. highland plants. Determine what the environment would be at the intersection of the 2 sets. Also determine what type of plants would grow in this area.

ACTIVITY 15:

Living things reproduce themselves and develop in a given environment. To emphasize this to students, place a radiometer and a green plant on the desk. Hang a light over them. Turn the light on, then off. Ask the following questions:

1) What happens to the objects on the desk when the light is turned on? Off?

2) What makes the radiometer spin?

3) What effect does the light have on the plant?

4) How does the plant use the energy of the sun?

5) How can you determine whether or not light affects plants?

ACTIVITY 15: (Continued)

Visit a florist. Make plans in advance, so that he will emphasize this phase of plant growth. Assign individual study at home for the interested pupil. Using a black or opaque bag, he may cover a part of a green plant. The pupil will set up his own investigation. Let him choose the plant, the part of the plant to cover, and the number of hours the cover is to remain in place.

ACTIVITY 16:

To help students understand that, even though heredity determines the traits of living things, environmental differences can cause differences in living things. To show this, exhibit specimens of blue and pink hydrangea blooms.

1) How are these flowers alike ?

2) How are they different?

3) Why are they alike?

4) Why are they different?

5) How can one find out?

(Note: Differences in soil caused by environmental influences.)

Do the litmus paper test to determine what color the hydrangea blossom would produce.

ACTIVITY 17:

To help students understand that plants in one community differ from plants in another community because of the effect of the environment, do the following:

Several days before the lesson is to be introduced, display in the classroom two jars of water. In one jar place a piece of elodea, duckweed, or anacris (water plants). In the other jar place a plant which normally grows in soil (bean plant, zinnia plant, coleus, geranium, etc.) When a definite change is seen in the plant which normally grows in soil, call the attention of the group to the fact. What is the condition of the geranium plant? Why?

1) Will the geranium plant grow in regular soil?

2) Will the elodea grow in soil?

3) What other kinds of plants do you know that you would like to try to grow in water? (Cactus, etc.)

4) Have pupils bring plants from home.

5) What other plants would you like to try to grow in soil? (Water lily, etc.)

ACTIVITY 17: (Continued)

Take a field trip for the purpose of observing and investigating plant communities. This trip could begin in the schoolyard and extend to fields, woods, pond, and boggy areas.

1) Are the plants different in varying locations?

2) Were the plants in the pond larger of smaller than the plants growing in the soil? Why were the plants different?

3) Do you think the fact that plant life is different in different communities would mean that the animals in the two communities would be different? Why?

Bring back to the classroom at least three plants found in the water, three found in the soil in the woods, and three plants from a dry rocky hillside. Put one of each kind of plant in water. Put one of each kind of plant in soil. Leave one kind of each plant out of water and soil. Observe what happens to all plants.

1) Why did some plants not live in water?

2) Why did some not live in soil?

3) Why did some die out of water and soil?

Discuss with the group:

1) Why does the organism have these specific characteristics?

2) Have they always had these characteristics?

3) Why is it that all the plants and animals that live in this environment do not have the same characteristics?

Have pupils list ways animals and plants are adapted to:

Cold conditions
Dry conditions
Self-protection
Food supply
Light

ACTIVITY 18:

To help students understand the physical factors of the environment which help to determine the life of a given area, visit an area with a slope or hill which has a noticeable difference in elevation. In an area without hills, you may use several different communities, such as a field, swamp, or wooded area. The students are divided into groups and select a recorder to take notes for the group. This field trip involves determining the different communities and driving stakes to identify and label (by numbers) each community. As each community is determined, students should drive stakes to mark each area for future reference.

ACTIVITY 18: (Continued)

At the start of the trip, at the top of the hill ask students what type of plants they see. (Give names, if possible.) What is the nature of the undergrowth? (Give names, if possible.) Are there a great many low-growing plants? Why? Why not? Note as many characteristics of the area as possible. Pick up a handful of soil and note moisture and type. Note depth of decaying leaves on forest floor.

As you move to another area, let students help decide when you are in another environment and ask why? How can you tell? (Should be about middle of slope, but you should not tell them--must guide them into finding answers and seeing what you want to teach.)

Ask about:

a) Trees

b) If on windward side, the effects of the wind on vegetation

c) Major or any differences between two areas

d) Types of plants

e) Undergrowth

f) Understory

Proceed to the very bottom of slope, which should be quite different in physical appearance. Here ask questions of the same type as used in other areas, and note as many differences as possible.

ACTIVITY 19:

Ants, bees, birds and many kinds of mammals have developed social systems that increase the chances of the population surviving. Design a social structure for animals of the future considering:

Dominance
Feeding
Movement
Reproduction
Rhythms
  Time of feeding
  Time of reproducing
  Time of other activities
Migrations or homing
Other factors

Write a story about the way this new animal behaves and why it does things differently than it does now.

ACTIVITY 20:

Animals and plants may alter the environment of an area to such an extent that the prevailing environment is changed.

Have students find a "pioneer plant" on campus (grass between cracks on sidewalk). Watch the plant increase in size, providing conditions are conducive.

1) How do pioneer plants establish the ground to be used in the future for more advanced plants?

2) Can you recall a piece of sidewalk you've seen where a large tree (oak) has cracked and raised the cement? Does this happen in a natural environment where rock makes up the surface ground?

3) Why are shrubs and grass planted along the newly built highways? (Erosion, buffer effects)

4) How are ponds or shallow bodies of water converted to land areas?

   If a student knows a pond that is beginning to change, have him take pictures of the transition and make a notebook to share with the class. This may take 3-6 months.

ACTIVITY 21:

In the Canadian Rockies, beavers have been parachuted into the wilderness for ecological purposes.

1) Why do you think they are doing this? (To hold back water reserves, and conserve the fresh water supplies.)

   By cutting trees and building dams, the beaver changes his environment.

2) What other animals can you think of that change the environment?

ACTIVITY 22:

An index fossil is the preserved remains of an animal or a plant which lived and became extinct at the same time all over the world. Index fossils are used by geologists to put together a world wide geologic column in chronological order (on paper). Erosion, the uplifting and sinking of land areas, heat, pressure, and tilting have displaced the natural sequence of the layers of deposit and in some cases have totally removed layers.

Divide students into groups of three or four and have them construct several segments of a geologic column which can be put together by matching the type of deposit, (lime, shale, sand, granite, land fossils, plant fossils) and by matching the key fossils. Remember that the type of deposit can be the same and have been deposited at different time periods. Therefore, only the index fossil is a definite determiner of chronological order. After the students

ACTIVITY 22: (Continued)

have constructed their geologic column segment, check them for possibility only, and set up a learning station. Have the students reconstruct the column using their knowledge of index fossils.

Construct a column yourself (a big one) and cut it into sections and challenge the class to reconstruct it.

ACTIVITY 23:

Plan a field trip to The Florida State Museum at the University of Florida. The material stressed should be the extinction of pre-historic animals in Florida. View what is available and discuss the implications involved, and why they disappeared.

ACTIVITY 24:

Ask students to plan an imaginary vacation to a city in India, South America, or China. They will need to determine what they would take, how much money they would need, and how they would get there. Have them conduct a research project on the area they plan to visit, reporting on the environment, the economic status, and the climate. (Perhaps consulting a travel agency could give some information.) Have them write a general, overall view of what they think the people will be like and how the people will react to them. Ask them to write about the food, the transportation problem, the cultural environment, and the housing conditions. If automobiles are not prevalent, ask the students how this effects and limits the experiences of people. Do they think it deprives them socially and mentally?

Have the students next pick an imaginary person (their age) from the area they choose and write down in columns what he might do in his free time (if he has any), and then make a list of what the student does in his free time. What are the differences? Does the student realize the limitations placed upon the people living in overpopulated cities and countries? Does the student recognize what the overall effects are on the next generation and that the hereditary characteristics may be reshaped over a period of time?

Have a group discussion on the areas chosen, and let all members share with the class what they have learned.

ACTIVITY 25:

This activity should be presented to a group of mature students to stress individual differences and ways of life. The students should rank the eight lifestyles in order of what they desire to live, and if they have one of their own, they should feel free to write it and share it with the group. Monitor a discussion, which should be open and honest and also reflect the significance of the differences for the quality of our lives together as human beings.

ACTIVITY 25: (Continued)

Lifestyle No. 1

Life is something to be enjoyed fully through the senses - a way often referred to in male terminology as enjoying "wine, women, and song", or "eat, drink and be merry". The pursuit of pleasure is man's commitment and the goal which should motivate all persons. One should let one's self go, to seek new sense experiences, to be open, and to approach living with a feeling of joy and festival. Having a good time, not doing "good", is what life is about. Enjoyment is the keystone for life and for living.

Lifestyle No. 2

The contemplative life is the good life. Man must seek his true meaning by withdrawing from the world and its workings to think and to discover self-knowledge in a retreat removed from life's turmoil and tensions. This may be accomplished alone, in the mountains, or an island, or other places where a person may be isolated; or it may be accomplished in a community of persons seeking the comtemplative life; a farming community; a rural commune; a monastery, etc. The essential point of this lifestyle is the rejection of the work-a-day world for inner discovery and harmony which makes one fully human.

Lifestyle No. 3

A person should not withdraw from the world, keep aloof, or be self-centered. Life must involve full participation in social groups, stressing cooperation and social action to improve the group and the society. Be it in the suburbs or ghetto, rural or urban areas, persons have the obligation to love and serve their fellows and to promote justice. Energetic group action to relieve human suffering - poverty, poor health, aging, war, alienation, etc. - is the goal of life.

Lifestyle No. 4

A person should fit peacefully into the natural flow of life. Taking what comes, we should not be demanding, seeking to change others or to change ourselves - changing only to fit into the quiet flow of the universe. Man's goodness is his devotion to the refinement of himself, not dominating anything or anyone. This refinement involves fitting into life's processes in a natural way - on the edge of the sea, on a mountain top, in the ghetto - wherever one chooses to live. A body at ease, a mind relaxed and grateful to the world for life, a few comforts, and a few friends - these are the joys which come when you are yourself; open, honest, receptive. They are destroyed by frantic action, deep thought, or material pursuits. Relax, good comes of its own accord!

ACTIVITY 25: (Continued)

Lifestyle No. 5

The active life is a Good Life... and action is physical! Cutting a farm out from the wilderness, building a house full of furniture, constructing a bridge to span the river, bringing food to harvest, playing a great set of tennis, climbing a mountain, scoring three touchdowns, winning the big game - all are fulfilling. Life finds its zest and its meaning in overcoming obstacles, in conquering, in dominating by physical action.

Lifestyle No. 6

We should accept truths from many paths of life (religious traditions and philosophical systems) in molding our lifestyle. No one path should have our exclusive allegiance. Life should contain enjoyment, action, and contemplation in about equal amounts. We should not let one path of life, received from our parents, our society, or our history dominate us. We have got to work out our own lifestyle and our own commitments, defining the Good Life and its meaning. Life is a search through many different philosophies and religions - but in essence is a balance of action, thought, and enjoyment.

Lifestyle No. 7

Self-control should be the keystone of one's lifestyle. Not the easy self-control which comes by retreating to the mountains, but the self-aware control which comes from knowing about the world and the limits of human power. Never letting high ideals drive one to great optimism or plunge one to the depths of despair, our expectations should be directed by our reason. The good man doesn't expect social utopia, doesn't expect all sweetness and light to burst forth by human action, and doesn't expect happiness from physical comforts and satisfied bodily desires. Instead, the good man must firmly live ideals, guided by reason and reasonable expectations. In this way a person may maintain a sense of dignity and humanness in a world of great problems and simplistic solutions.

Lifestyle No. 8

Life too often becomes too comfortable and secure. To be fully alive, we must seek out challenges - problems to solve with our own minds and inventiveness. Human progress depends on creative solutions to problems and finding new ways to fulfill needs. The salesman finds new ways to set higher records. The business person finds ways to expand the firm. The scientist must discover new methods and techniques. The manufacturers seek better products at higher profits. Life doesn't require dreamers, historians, poets, and opera singers, it demands humans who can confront and solve today's problems with their own intellect and insight.

OBJECTIVE

To compare man's successful and unsuccessful means of dealing with the environment.

The more we demand in the way of man-made products, services and comforts, the more our natural environments must be changed to accommodate us. In other words, we make trades continually. To use electricity, we must pollute our environment. To promote bugger cities and more people, we must change or destroy the natural landscape and its related ecological cycles. We must realize, however, most of our trades are irreversible and we cannot trade back for what we had before. On some environmental problems not enough is known for effective action. In too many cases, a problem has been attacked without concern for its relationship with other problems. As a consequence, one kind of pollution may unwittingly be traded off for another; a dam built to solve a water supply problem may create worse problems for the overall ecology. For instance, a mangrove or cypress forest, which took millions of years to develop and upon which so many ecological interrelationships depend, cannot be reestablished once man has draglined or dredged and filled it for a housing development. It cannot, even in many generations of man, be returned to the productive swamp it once was. It is, for all practical purposes, gone forever.

ACTIVITY 1:

Ask students to locate examples of successful and unsuccessful environmental practices on the school campus. Teams may be assigned as "unsuccessful" and "successful". Each team compiles its list and a class discussion is held to determine whether the school environmental practices have been more successful, or more unsuccessful. Present findings to PIC or Citizen's Advisory Council.

ACTIVITY 2:

Have your class examine the school building and campus support systems. (Water, electricity, oil, sewage, solid waste, food supply, gas, etc.) The class should divide into teams, each team concentrating on one system. Next, connect the different support systems with those found in the community. A bulletin board can be constructed with the names of the systems and strings connecting interrelated and interdependent systems. What happens when a system is overloaded? Does it affect other systems? What can be done to keep a system from becoming overloaded?

ACTIVITY 3:

Have your students make a survey of the school campus for signs of erosion. A school campus map should be used and the areas showing

ACTIVITY 3: (Continued)

signs of erosion should be indicated. Record the type of soil in the area and also vegetation types. The erosion should be classified according to what caused it; wind, water, cars, people, etc. Remedies should be formulated and a plan of action devised. The students should be allowed to make the campus improvements.

ACTIVITY 4:

Have students construct several different types of bird houses, feeders, and baths. Place these in different areas of the campus. The students should organize maintenance teams to keep the feeders and baths filled and cleaned. Allow students to observe birds. Keep a species list. What foods bring the most birds? What birds are nesting in the bird houses? Bulletin boards with magazine pictures of the birds frequenting the area can be made. Reports on the life habitats and natural history of each bird can be given. Have a member of the local Audubon Society come to your class and talk about birds of the area.

ACTIVITY 5:

Divide the class into groups. Using a basic outline map of the community, have one group show the area as it exists today; have a second group show the area as it was 25 years ago; a third group should depict it as it was 50 years ago; and a fourth group, as it was 100 years ago. This information can usually be obtained from town records. To discover what your local area was like in the eyes of its residents, have one group interview residents of the town who have lived there for 25 years. Have another group interview a 40 to 50 year resident of the community. When all data has been collected and summarized, list the changes which have occured.

1) Were these changes helpful or harmful to the people; to the environment? Explain.

2) Looking back, what could have been done to prevent the harmful changes?

3) Looking ahead, based on what we now know, what changes do you foresee?

4) Will these be helpful or harmful? Explain.

5) Will the harmful changes destroy us?

6) What can we do to prevent the harmful ones?

7) How could this process you have employed be modified for use on a national scale?

ACTIVITY 6:

Find some change or changes in the Florida environment (natural or man-induced) that are taking place. They may be either favorable or unfavorable. Try to answer the following questions about your change(s).

1) Was this change predictable a few years ago?

2) What future changes would you predict this change will produce?

3) Is your change a desirable one or an undesirable one? Explain your choice of answer.

Some examples of change that can be used are:

1) Zoning laws

2) Genetic changes

3) Population pressures

4) Loss of natural habitat

5) Transportation

ACTIVITY 7:

Make a scrapbook of newspaper and magazine articles, and advertisement clippings that deal with man killing insects. How are the insects affected and how does this affect man? Then discuss the following questions.

1) Why are insects a pest to man?

2) Are all insects bad?

3) How does man control the bad insects? Are there any harmful side effects in using chemicals to kill insects? What kinds of harm can be done?

4) How do insects, such as flies, develop resistance to insecticides? What are some of the unique factors that allow insects to adapt so quickly while man and many birds do not adapt?

5) What kinds of biological controls for insects have been developed? (Sterile males, insect viruses, insect predators, such as the lady beetle, sex attractants, etc.) Do you think that we could develop some effective biological controls if we would spend as many dollars on this kind of research as we have on chemical controls?

ACTIVITY 8:

In Asia, DDT is used as a weapon against malaria. Without it, thousands might sicken and die as they did before DDT was discovered.

1) How do you think the savings in human life balances against the destruction of wildlife brought about by DDT? Prepare a two-column list. In the first column, list the savings in human life possible because of the destruction of disease-carrying bugs. In the second column, list the losses to nature which DDT causes.

2) How does your list make you feel?

ACTIVITY 9:

We know that DDT is destroying wildlife and is now affecting the health of humans who eat the wildlife that ate the DDT-sprayed plants. But if DDT were to be outlawed the world over, millions would die in India of malaria.

1) If you had the power to outlaw DDT, what would you do?

2) How would you begin doing it? Begin!

ACTIVITY 10:

In order to stop continued mercury pollution of river waters, an Eastern seaboard plant will have to shut down operations, throwing more than 35,000 people out of work in a one-industry town. Understandably, the people think the mercury poisoning not as important a problem as their financial ruin. Suppose you had authority to shut down the plant.

1) What would you say to them?

2) What do you think they will reply to your statements? Go out to a pollution-producing factory, and ask the workers to give their views on pollution.

ACTIVITY 11:

Rivers are used as a relatively cheap method for sewage disposal. If we were to enact legislation prohibiting sewage in rivers, disposal plants would be a necessity.

1) Who should be responsible for building these plants?

2) Who should pay for them?

ACTIVITY 11: (Continued)

3) Who should be responsible for inspection and control? Prepare a press release (as if you were the Governor of a state about to place such requirements) justifying the new law on sewage disposal.

ACTIVITY 12:

A strange fungus has suddenly attacked large areas in a certain farming region near a city. The farmers want to use large-scale spraying of insecticides in order to kill the fungus, save their crops, and prevent further spread of the disease. Other people are protesting the use of the insecticides. They think the infected crops should be burned in order to kill the fungus. Of course, the farmers' crops would then be a total loss.

1) What are the advantages and disadvantages of either choice?

2) What would you suggest as a solution?

ACTIVITY 13:

If you were a U.N. advisor to an under-developed nation considering the construction of a dam, and if you had seen the mixed blessings of Aswan Dam, Egypt, how would you advise the government of the under-developed nation? What are your priorities?

Role-play this situation before a group, and discuss the attitudes, feelings, and ideas that such activity generates.

Here are some possible roles that should be included:

a) Minister of the Interior, responsible for increasing agricultural production.

b) U.N. advisor, doubtful about the long-range values of an Aswan-style dam.

c) Farmer, who experiences annual floods of his crops because there is no dam.

d) Public health officials, concerned about the health effects of damming the river.

e) United Nations official, anxious about the possible conflicts that might result if this country (call it Gazaland) dams the river which for centuries has flowed into neighboring nations.

f) President of the Republic of Gazaland, who desires to show the world that his nation can become modernized and developed.

ACTIVITY 14:

The people of Middletown were concerned that their small community would become a ghost town and that they would have to leave their homes and neighbors whom they had known most of their lives. Although the community is small (5,000 people) over half of the adults are employed in the big paper mill located in the town and a large majority of the remainder are dependent on it in some way. Therefore, the proposed closing of the plant for violations of anti-pollution laws is a great threat to the townspeople.

The plant has been an integral part of the lives of Middletown residents for over fifty years. The town was dying in the 1920's when the plant came in and brought prosperity--it carried them through the depression when other towns suffered. The taxes paid by the plant helped to support fine schools and a responsive municipal government. Public facilities such as the hospital, library, and swimming pool are outstanding for this rural area due in large measure to the contributions made by the paper company. The company officials take an active interest in the community by serving in many civic associations. In addition, many of the plant workers serve in government posts such as the town council, the volunteer fire department, and the library commission.

Nevertheless, the plant does pollute. The air is fouled by the yellow sulfurous discharge, and the river is the outlet for the black ooze from the pulping process. Persons in the outlying county and those downwind have long complained about these matters. But town and county officials did nothing about it. However, three years ago the state passed a strong anti-pollution statute, and the company was forced to install five million dollars' worth of pollution abatement equipment. Unfortunately, this equipment never really worked well. Thus with the drop in paper prices and the high cost of maintaining the pollution control equipment, the company went bankrupt.

Last year a new outfit of local people bought the plant and tried to get the jobs going again. However, the stream and air which had cleared up with the closing of the plant, became filthy again. People in the surrounding county and the downstream-wind areas are understandably upset. Just last week, fish put into the river by the State Fish and Game commission died in a fish kill. Many of the residents of Middletown want the state law repealed while many of the county residents desire that the law be made more stringent in order to protect the environment. To resolve the problem, the state legislature has sent a committee to Middletown to conduct hearings on the controversy.

Role-play the situation designating students to fulfill the following roles and to testify before the committee:

a) An employee who has two children to support.

b) A local businessman whose survival depends on the plant.

ACTIVITY 14: (Continued)

c) The Mayor of Middletown who points out what benefits the company brings to the town through increased revenues.

d) A resident of the county not dependent on the plant.

e) The owner of a campground downstream from the plant.

The remainder of the class can act as the committee and ask questions of those testifying.

ACTIVITY 15:

Should government intervene to "save the environment" and preserve the quality of life, or should it act in the interest of national economic development and prosperity and more profits to stockholders? To develop a "feel" for the kind of ethical issues which underlie the cases presented below, take a look at the following questionnaire; skim it quickly. Then read each question carefully and indicate your choice in the space at the right.

Select from the numbered categories the response which best indicates your attitude toward each statement.

1) Completely Disagree
2) Mostly Disagree
3) Slightly Disagree
4) Slightly Agree
5) Mostly Agree
6) Completely Agree

STATEMENT	RESPONSE
A. It is primarily the government's responsibility to protect the environment.	
B. Like most citizens concerned about the state of the environment, the President, Congressmen, and other political officials consistently act in its best interest.	

ACTIVITY 15: (Continued)

C. Political officials should always act to preserve and protect the natural environment.

D. In underdeveloped nations, like Egypt and India, where many people are without a job, a home, and even food, the government should do everything possible to raise the standard of living--even at the expense of the environment.

E. Most political officials find it easy to act in the interest of the environment, since the issue "saving the environment" is clearly distinct from all other related issues.

F. When the interest of a few and the interest of many is in conflict, government should always act in accordance with the latter, unless such an act would jeopardize the natural environment.

G. Government should not allow anyone to pollute the environment, even if they pay for using it.

H. Even though the environment is involved, the government should avoid any action which might cause people to lose their jobs or in some way create a financial burden.

I. If an elected public official were in a dilemma between choosing to protect an endangered species, like the American bald eagle, and acting to guarantee re-election, you would encourage him to do the latter.

J. Victory and peace at any price, even at the expense of the environment.

Once you have completed the questionnaire, discuss your responses with others in small groups.

ACTIVITY 15: (Continued)

Note any inconsistencies in responses (e.g., questions C & D, and G & H) and ask for reasons which justify those inconsistencies.

When you have finished discussing the initial responses, move to the cases, reading and discussing each case carefully. Since the cases relate to one or more of the items on the questionnaire, you may want to refer occasionally to your initial responses.

After reading and discussing the cases, complete the questionnaire a second time. Are your responses the same or different? Why? Do you have stronger feelings than before about any of the questions?

ACTIVITY 16:

Do a "man-on-the-street" routine. Select persons who vary in age, sex, dress, education, occupation, and residence. Ask them to complete the questionnaire. You will need to make some form changes on the questionnaire so that people can indicate their sex, education level, etc. In addition, you may want to include other questions which you feel are appropriate. After the questionnaire has been administered, tally the results. Then ask yourself questions like the following: Do people with the same amount of education tend to respond similarly to specific questions? What does this mean? Are younger people more concerned about the politics of the environment than older people? Why? You will be able, no doubt, to pose additional questions about your results. Discuss the results, your analyses, and your conclusions with others.

ACTIVITY 17:

How can you kill harmful pests? Spraying a population with chemical poisons seems like one good solution. In this investigation you will grow mold colonies on bread and evaluate a chemical poison, a disinfectant, as a means of pest control.

Materials:

4 slices of white bread	tweezers
2 glass pie pans	dust cloth
4 plates (smaller than pie pans)	scissors
plastic sandwich bags	paper towels
bottle of spray disinfectant	

Place two pieces of bread in a sandwich bag. Close the bag. Put aside this bread and two plates for use later in the investigation.

Cut the paper towel into two circles the same size as the remaining two plates. Place one circular towel on each plate.

Slowly pour water onto each plate until the paper towel is damp.

Place one piece of bread on each plate. Put the plates together so that their rims are touching.

Wipe a dust cloth across a shelf, counter, or table top. Shake the cloth over the bread on both plates. Separate the plates.

Spray one piece of bread with disinfectant. A light spray over the exposed surface is sufficient. Be sure to spray the crusts. Label this plate "Sprayed-1."

Do not spray the second slice of bread. Label this plate "Control-1."

Place a pie pan upside down over each plate. Elevate the pie pans above the table by placing folded pieces of paper towel under the rims of the pie pans.

Observe the bread daily. Is disinfectant a successful method of controlling the growth of mold on bread? Did some mold grow on the bread labeled "Sprayed-1"? Investigate further.

Prepare two more plates with circular towels. Slowly pour water into each plate until the paper towel is damp.

Remove the bread from the sandwich bag and place one slice on each plate.

Wash the tweezer in hot water. Dry.

Examine the mold colonies on the "Sprayed-1" and "Control-1" bread. Select mold colonies of the same size and color on each slice of bread. With the tweezer, carefully pick up the colony from the "Sprayed-1" bread and transfer the mold to one piece of fresh bread Label this plate "Sprayed-2."

Wash and dry the tweezer.

Spray both slices of bread with disinfectant.

Cover each plate with a pie pan. Elevate the pie pan above the table with folded pieces of paper towel.

Discard the molded bread and used towels.

The paper towels on each plate should be kept damp. You may have to moisten the towles with water daily to prevent the bread from drying.

Observe the bread daily. Is there a difference in the mold growth on each slice of bread? Compare your results with the results obtained by other investigators in the class. Can you explain these results?

ACTIVITY 17: (Continued)

Is disinfectant a successful method of controlling the growth of mold on bread?

1) Why were the bread slices covered. . .first with a plastic bag, and later with the pie pans?

2) Why was the pie pan raised above the table with folded pieces of paper towel?

3) What was the purpose of the moist paper towel?

4) What was the purpose of shaking the used dust cloth over the slices of bread?

5) Why were mold colonies of the same size and color transferred from the sprayed and control slices of bread?

Based on your results in this investigation, describe the strengths and weaknesses of chemical poisons as a method of pest control.

ACTIVITY 18:

Eutrophication is a process by which a body of water gets rich in plant life nutrients, and animal life, and then dies. Large populations of decomposers and the organic materials which they feed on play a vital part in the death of a lake. In this investigation you will study how the action of decomposers on organic matter changes the quality of a body of water.

Materials:

5 test tubes	plastic wrap
5 corks	masking tape
bromothymol blue solution	medicine dropper
water	test tube holder

Fill five test tubes about one-half full of water. Add 5 drops of bromothymol blue solution to the water in each test tube. The water should turn a deep blue color.

Press a 5-cm strip of masking tape on each test tube. This tape is the label on which you will identify the contents of each test tube.

Place the test tubes in a test tube holder or container. Secure a cork in the mouth of each test tube.

Label one test tube "Control." Nothing else will be added to the water in this test tube. Take the other four test tubes home with you at the end of your school day.

What organic matter in your environment would pollute the water in a lake? Garbage (potatoe peels, meat scraps), dead grass, decaying leaves,

ACTIVITY 18: (Continued)

silt from a pond floor, mud from a puddle, algae from a pond or lake are possible answers. To test your answers, add a small quantity, about the size of a pea of one organic material to each test tube. Label the test tube to indicate what organic matter was added to each.

Bring the test tubes to school the following day. Remove the corks. Add water to the contents of each test tube so that only about .5-cm of air remains at the mouth of the test tube. Remember to add water to the contents of the "Control" test tube, also.

Wrap a 5-cm square of plastic wrap around the bottom of each cork. Insert the corks into the test tube so that the plastic wrapped end is in the water. Some water in the test tube may overflow as you insert the corks. Be sure that there are no air spaces at the top of the test tube.

Mix the contents of each test tube by gently rotating the test tubes between your hands. Return the test tubes to the holder.

Observe the test tubes for five days. Record your observations daily, comparing each test tube to the "Control."

Bromothymol blue is used to indicate the presence of CO_2. In the presence of CO_2, the bromothymol blue changes from blue to yellow. Remember, as decomposers act on organic waste in the water, they use up the O_2 dissolved in the water and release CO_2 into the water. What color change would you expect in water samples containing decaying organic matter?

You may want to record your results on a chart similar to this:

Contents of Test Tube	Observations				
	First Day	Second Day	Third Day	Fourth Day	Fifth Day
Control					
Meat Scraps					
Dead Grass					
Potato Peel					
Green Algae					

ACTIVITY 18: (Continued)

1) Which test tubes showed a color change toward dark blue?

2) Which test tubes showed a color change toward a lighter or yellow color?

3) Which organic matter provided good nutrients for the decomposers?

4) Describe the "dying process" of a body of water.

5) Which part of the dying process was seen in this investigation?

6) If organic matter were added to water containing bromothymol blue and the solution immediately turned yellow, what would you conclude?

7) Burning is one of the chief causes of air pollution. You will begin to appreciate the problem caused by burning if you hold a plate over the flame of a burning match. After the match has burned for several seconds, observe the bottom of the plate. What do you observe? Can you explain your observation? How do you think the amount of pollution produced from the burning of a match compares with the amount of pollution produced from burning leaves in your back yard? Coal or oil to heat a home and school? Fuel in a large factory?

8) Various pollutants may be in the air, including sulfur-oxygen compounds. With the aid of your teacher, sulfur-oxygen compounds can be detected by means of an indicator made of a 10 percent barium chloride solution and a few drop of hydrochloric acid. If a suction pump draws air through a jar containing this indicator, the sulfur-oxygen compounds present in the air will react with the indicator to form a white precipitate.

   Are sulfur-oxygen compounds polluting the air in your environment?

ACTIVITY 19:

This game helps students to understand the process of adaptation.

Out of a small sack of river gravel (marbles can also be used), mark 10 stones with "A" for Adaptation. Mix the stones and proceed to define two sets of students - "the pelicans" and the "mosquitoes." Tell the students that there is a strange chemical in the air that can kill some of us. In order to survive as a species you must adapt. A new generation is created by picking stones. More stones increase the chance of picking an "A" stone. It must be pointed out that picking an "A" stone merely means there was a chance for adaptation, not a promise. Since the pelicans breed slower than mosquitoes do, the mosquitoes get to pick 25 times for every one pick of the pelicans. The pelicans will complain but "such is life." Let the pelicans choose two stones and let the mosquitoes pick 50. In life the chance of having a mutation that results in an adaptation is one in millions. Further, the chance that the adaptation is beneficial for the conditions present is one in millions. Thus you can see that the likelihood of a beneficial mutation occuring that will allow a species to quickly adapt to an environmental condition is very small for slowly reproducing animals such as pelicans or man. The chances are reasonable for mosquitoes and many other smaller insects.

1) If an adverse environmental condition develops over a period of 10 years, do you think it is very likely that pelicans or man would adapt? (No, odds are against it.) What about mosquitoes? (Chances are good.)

2) Many insects have adapted to DDT. Why haven't pelicans, ospreys, eagles, etc. adapted? (For the reasons given above.)

Discuss natural control of pests as more desirable than chemical pest control. Most pests are small and have high reproductive potentials. Their evolutionary potential allows them to adapt to harmful chemicals while larger animals, including man, cannot adapt to them.

Alternatives to hard pesticides:

a) non-persistent "soft" pesticides

b) biological controls (animals and other insects)

c) companion planting

e) research and development

What can you do:

a) grow own garden

b) buy uncontaminated foods

c) write legislators

d) replace spray with fly swatter

ACTIVITY 19: (Continued)

e) clean up - don't feed scavenger pests like roaches and rats

f) support research into hard pesticides

ACTIVITY 20:

To investigate the chemicals such as ammonia nitrate and potassium phosphate and their effects on plant growth.

Chemicals such as nitrates and phosphates are often added to detergents to soften water and to help produce a cleaner, whiter wash more quickly. The chemicals do not disappear when placed in the washing machines. They are almost impossible to remove from sewage thus entering lakes, ponds and streams where they alter plant life.

Visit a pond, lake or stream and collect plants such as duckweed, elodea, etc. Place the plants in 3 miniature aquaria such as quart jars. Be sure to place the same amount of water and gravel in each as well as the same number of plants. Do not place any type of animal life in the aquaria. Place each aquarium in the light. Add ½ teaspoon of ammonia nitrate to one of the aquaria, and ½ teaspoon of potassium phosphate to the second. Do not add anything to the third aquarium. Be sure to label the jar.

Examine the aquaria each day to note any changes in plant life. Record their observations in a notebook. After 3 or 4 days add ½ teaspoon of each chemical to the aquaria once more. Record observations of difference for 4 or 5 weeks.

1) Why was a third aquarium with no added chemicals used in this experiment?

2) When did another type of green plant life first appear? What type was it?

3) How does the addition of more chemical affect the rate of growth of this form of plant?

4) In which aquaria was the amount of this green plant the most? The least?

5) What changes occurred in the elodea and other plants you put in the aquaria?

6) What would the algae do to the sunlight needed by the other plants?

7) What would algae use up that the elodea and other plants would require in order to live?

8) What would eventually become of the plants that were initially growing in the aquaria?

ACTIVITY 21:

Along the lines of Who Really Killed Cock Robin?. write a brief "natural mystery" story, beginning with a discovery (a pile of feathers: a dying swamp: a dwindling population of something; etc.), gradually revealing clues as to the cause(s), and at the end revealing the guilty party. The story should reveal relationships as the plot unravels. Try to create interest by planting false clues that lead nowhere. One more thing: your clues could be described or photographed or even recorded on tape; also, consider drawing a map, using actual samples as clues, etc.

ACTIVITY 22:

Successfully introduced exotic plants and animals frequently displace native organisms and become pests.

Have one segment of the class do research on exotic animals. When the pictures and data are collected, have small groups of students make learning centers that show the exotics and their effects on the environment.

1) In what year were Hyacinths first discovered in Alachua County? When were they first considered a pest?

2) How have Hyacinths produced a problem in Alachua County? How do they affect boating? Fishing? Swimming? Water flow?

3) What methods of Hyacinth control are available? Which methods are currently being used in Alachua County?

4) Why do they grow so rapidly and suppress our own local water plant species? Are they a big problem in the country they came from?

5) What do you think would happen to our water resources in Alachua County if the Hyacinths weren't controlled at all?

ACTIVITY 23:

As a class experiment, try to grow exotic plants in the same area on campus with common plants. Record their growth and watch the relationship among all the plants.

1) Did the exotic plant displace the native species?

2) Do exotics always displace native plants? Why?

3) Why do some exotics become pests while others can barely compete?

ACTIVITY 24:

Deterioration of soil is the same, in effect, as a reduction in the amount of land.

To help students understand that when the soil deteriorates to a point where it is not as productive as it could be, it is the same as a reduction in the amount of land.

Prior to the lesson, the teacher selects two sites. One of these should have productive soils with good growth of plants. The other should be poor, rundown, depleted soil that is caused by erosion, overcropping, or other misuse. (More than two sites should be selected, if possible. The time available will determine this. On a camping trip many sites could be observed.) On the day of the lesson, pupils are taken to the sites. They now observe and compare the growth of plants and other conditions in the area. What are the explanations for the various conditions that exist?

1) What difference do you see in the plants (if any) growing in the areas?

2) What are the factors that influence their differences?

3) What effect will these differences have on the productive capacity of the soil?

4) What effect will these differences have on the use of this land for purposes other than producing crops and plants?

5) How would the value of these areas for production compare with each other? For industry?

6) What happens when water falls on a hill?

7) What effect does running the rows around the contour of the hill have on the amount of water that runs down the hill?

8) Why is it important not to allow the water to run down the slope?

9) What are we actually doing when we run the rows around the contour of the hill?

10) What is the value of this?

The pupils are asked to consider ways the principle of contouring can be used. Pupils are asked to observe (and record) what has happened to the soil where there is little or no vegetative cover. The teacher, in order to help the pupils become aware of the necessity for good ground cover on sloping land or land subject to wind erosion, asks questions such as:

1) What would happen over a period of years if soils were kept bare of vegetation?

ACTIVITY 24: (Continued)

2) How would this affect its uses?

3) How would this affect its value for farming? Industry? Homes?

4) What could be done to the land and still make intensive use of the land?

All during the lesson the pupils have been asked to observe areas of good soils with productive plants growing and compare this with areas with depleted soils (due to erosion, etc.) with little or no plant growth. They are now asked questions such as:

1) What would be the effect on the economy if the area of depleted land was removed?

2) What would be the effect on the economy of the region if the area of productive land was removed?

3) How can the area of depleted land be restored to useful purpose?

4) What are some useful things this area might be used for?

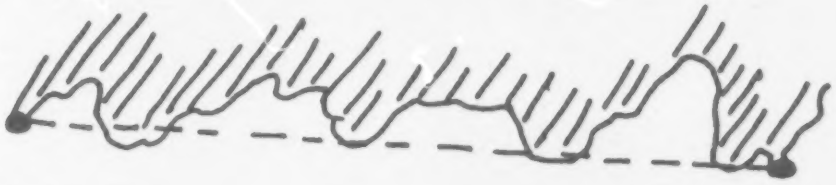
Students are asked to observe areas in the community where soil has been depleted to a point where it has little useful value.

Note: Houses, children, health. Is there any indication of the standard of living on these sites? Investigate a one-crop economy; Appalachia.

ACTIVITY 25:

Man induced changes in the environment stress populations until they die out.

Have students make a "mangrove line" (wiggly) on a piece of paper with a dot at the beginning and end of the line.



seawall - - - -

mangroves ————

Then have students draw a "seawall line" (straight) between the two dots. Now place string over the "mangrove line" and also over the "seawall line." Once the students have done this, have them mark the ends of the strings and pull them straight. Measure the lengths of the two strings and determine the difference between the two. Express the seawall length as a percentage of the mangrove coast.

ACTIVITY 25: (Continued)

$$\text{Seawall \% of mangrove coast} = \frac{\text{length of seawall}}{\text{length of mangrove}} \times 100$$

1) Does the seawall considerably shorten the shoreline? (Yes)

2) How would a shorter shoreline affect the animals living in this area?

   (It would reduce the size of their populations since it would greatly reduce the bottom area which they live on or in. It would also reduce the surface area for sessile organisms to attach to. Mangrove prop roots have a large surface area compared to seawalls. See if the students can think of any other ways that it would affect these populations.)

3) What other changes would occur in this environment if man created a seawall? (Fill the bottom, increase turbidity, deepen the water at the face of the wall, etc.)

ACTIVITY 26:

Using the lists of "man's beneficial influences on the environment", "man-made disasters". and "environmental organizations, materials and sources", have the students:

1) make a photographic essay

2) make a magazine and newspaper picture booklet

3) write reports

4) design a bulletin board

5) grow plants hydroponically

6) grow hybrid and non-hybrid plants and compare growth rates in tables and graphs

7) create hybrid or "pure" strains by pollenating flowers on a plant, protect from other pollen by placing a plastic bag over the flower and securing it with twist ties

8) invite guest speakers

9) plan field trips

"Man's Beneficial Influences on the Environment"

I. Increased Food Yield

   A) Fertilizers
   B) Micro-minerals
   C) Pesticides
   D) Herbicides
   E) Fungicides

ACTIVITY 26: (Continued)

F) Hybrid and new variety "super-seed"
G) Irrigation
H) Nitrogen fixing bacteria (legumes and grasses) (new research development - Univ. of Florida)
I) Strip cropping
J) Contour plowing
K) Sledge from sewage plant residual used to add organic matter to soil
L) Compost plants
M) Biological control or insects
N) Companion planting
O) Wells
P) Diversion of water
Q) Drying of seed
R) Windmills
S) Equipment
  1) tractors
  2) sprayers
  3) discing equipment
  4) fertilizer and seed spreaders
  5) harvesters
  6) refrigerated trucks and trains

T) Weather prediction
U) Hydroponics
V) Preservation of food
  1) freezing
  2) canning
  3) drying
  4) smoking
  5) dehydration
  6) freeze dried
W) Purebred livestock
X) Research
Y) Weapons for hunting

II. Increased Water Supply

A) Wells
B) Desalination
C) Canals
D) Water storage areas
E) Dams

III. Increased Energy Sources

A) Geothermal
B) Solar energy conversion
  1) battery
  2) heating and cooling, solar plate collectors
  3) solar houses
C) Nuclear fusion
D) Nuclear fission
E) Natural Gas

ACTIVITY 26: (Continued)

F) Oil Wells

1) Offshore drilling
2) Alaskan Pipeline
3) Reserves (Protection in event of war)

IV. Disease Control

A) Immunization
B) Drugs
C) Serum
D) Operation
E) Transplants
F) Sanitation
1) Cleanliness
2) Sewage
3) Garbage and Trash disposal
a) don't feed scavengers like roaches and rats
b) compost - conversion to fertilizer
c) conversion to fuel

V. Housing

A) Insulation
B) Heating and Cooling
C) Dehumidifiers

VI. Use of Fire

A) Cooking of Food
B) Heating of Homes
C) Making of machinery, weapons

VII. Birth Control

VIII. Attempts to repopulate and protect endangered species of animals and plants.

"Man-Made Disasters"

1) The Dust Bowl
2) Destruction of the Everglades
3) Thermal Pollution
4) The Great Barrier Reef
5) The Aswan High Dam
6) Stream Channelization
7) The Dugway Incident
8) Vietnam: Cratering
9) Vietnam: Defoliation
10) The Denver Incident
11) Oil Spills
12) Canal Construction
13) Amazonia

ACTIVITY 26: (Continued)

14) Strip Mining
15) San Francisco Bay
16) The SST
17) Landfill and Developement
18) Radioactive Wastes
19) Ozone Destruction
20) Food Additives
21) Hard Pesticides
22) Chemical Pollution
23) Thermal Pollution
24) Increase of CO^2 in atmosphere
25) Burning of fallow land and woodlands
26) Forest Fires
27) Tuna Industry, killing of dolphins
28) Buffalo, Sandhill Cranes, other endangered species

ENVIRONMENTAL ORGANIZATIONS, MATERIALS AND SOURCES

Many helpful pamphlets and booklets can be obtained from these sources:

AIR

Air Pollution Control Association
4400 5th Avenue
Pittsburgh, PA 15213

Citizens for Clean Air
40 W. 57th Street
New York, New York 10019

BEAUTIFICATION

Garden Club of America
598 Madison Avenue
New York, New York 10022

FOREST AND CONSERVATION

The Wilderness Society
729 15th Street, N.W.
Washington, D.C. 20005

NOISE

Citizens for a Quieter City
150 Amsterdam Avenue, N.
New York, New York 10023

ACTIVITY 26: (Continued)

POPULATION

Zero Population Growth
367 State Street
Los Altos, California 94022

WATER

Water Pollution Control Federation
3900 Wisconsin Avenue, N.W.
Washington, D.C. 20005

Water Resources Council
2120 L Street, N.W.
Washington, D.C. 20037

WILDLIFE AND ANIMALS

National Wildlife Federation
1412 16th Street, N.W.
Washington, D.C. 20036

Sport Fishing Institute
608 13th Street. N.W.
Washington, D.C. 20005

National Audubon Society
950 3rd Avenue
New York, New York 10022

Izaak Walton League of America
1800 North Kent Street
Arlington, Virginia 22209

GENERAL ENVIRONMENTAL PROTECTION AND INFORMATION

National Center for Resource Recovery, Inc.
1211 Connecticut Avenue, N.W.
Washington, D.C. 20036

The Sierra Club
220 Bush Street
San Francisco, California 94104

Friends of the Earth
30 East 42nd Street
New York, New York 10017

Environmental Action Committee
2000 P Street, N.W., Room 200
Washington, D.C. 20036

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ACTIVITY 26: (Continued)

GOVERNMENT AGENCIES

These agencies disseminate information, films, and materials for school or club use. Write for particular requests or general information.

Johnny Horizon '76 Program
U.S. Department of the Interior
Washington, D.C. 20240

Soil Conservation Service
U.S. Department of Agriculture
Washington, D.C. 20242

Environmental Protection Agency
Waterside Mall
401 M Street, S.W.
Washington, D.C. 20460

National Industrial Pollution Control Council
U.S. Department of Commerce
14th Street & Constitution Avenue, N.W.
Washington, D.C. 20230

National Park Service
U.S. Department of the Interior
Washington, D.C. 20240

Office of Environmental Education and Interpretation
Fish and Wildlife Service
U.S. Department of the Interior
Washington, D.C. 20240

Bureau of Land Management
U.S. Department of the Interior
Washington, D.C. 20240

Bureau of Outdoor Recreation
U.S. Department of the Interior
Washington, D.C. 20240

TRADE ASSOCIATIONS AND INDUSTRIES

Materials are available on individual company's involvement in environmental protection and on specific problem areas.

The Aluminum Association
750 Third Avenue
New York, New York 10017

ACTIVITY 26: (Continued)

American Iron and Steel Institute
150 East 42nd Street
New York, New York 10017

American Petroleum Institute
1801 K Street, N.W.
Washington, D.C. 20036

American Forest Industries
1619 Massachusetts Avenue, N.W.
Washington, D.C. 20036

American Paper Institute
260 Madison Avenue
New York, New York 10016

Glass Container Manufacturers Institute
330 Madison Avenue
New York, New York 10017

National Solid Waste Management Assoc.
1145 19th Street, N.W.
Washington, D.C. 20030

Society of the Plastics Industry
250 Park Avenue
New York, New York 10017

PUBLICATIONS

You can write to the magazines and newsletters for sample copies or subscription rate information. Your public library will have some of these and other periodicals.

Audubon Magazine
National Audubon Society
950 Third Avenue
New York, New York 10022

Eco-News
235 East 49th Street
New York, New York 10017

Environmental Action
1346 Connecticut Avenue, N.W.
Room 731
Washington, D.C. 20036

Catalyst for Environmental Quality
274 Madisor Avenue
New York, New York 10016

ACTIVITY 26: (Continued)

National Park and Conservation Magazine
1701 18th Street, N.W.
Washington, D.C. 20009

Conservation News
National Wildlife Federation
1412 16th Street, N.W.
Washington, D.C. 20036

Environment
Scientists Institute for Public Information
P.O. Box 755
Bridgeton, Missouri 63044

Environmental Education Report
1621 Connecticut Avenue, N.W.
Washington, D.C. 20009

REPORT RESEARCH ITEMS

Food and Drug Administration

Health, Education, and Welfare

Agricultural Extension Service

Federal Housing Administration

ACTIVITY 27:

Using the list of "Environmental Disasters" have the students involved in role-playing, writing short plays, playing games, learning the names of community agencies that help in disasters, finding examples of real disasters and trying to determine if following the safety guidelines would lessen the effect of the disaster. (Resource Booklets: 1) Civil Defense Booklet, "Games That Teach" M.P.-59; 2) Defense Civil Preparedness Agency: "Your Chance to Live"; SM3-12.

"ENVIRONMENTAL DISASTERS"

1) Earthquake
2) Hurricane
3) Tornado
4) Tidal Wave
5) Volcano
6) Atomic explosion
7) Fire
8) Sun - Heat Stroke
9) Flash floods
10) Floods
11) Blizzards
12) Chemical and radiological accidents
13) Disease epidemics

OBJECTIVE:

To identify ways in which man can contribute to the protection and improvement of ecological systems.

ACTIVITY 1:

Pupils should understand that man is the only organism that can change, modify, or improve the environment for the benefit of all living things. Have the following objects on a tray:

A match
A book
Can of food
Bottle of medicine
A lump of mineral substance labeled "Radioactive"
A toothbrush
An airplane model
A small radio
A test tube
A model of a spaceship

Ask questions:

1) What are these objects?

2) Where did they come from:

3) Why were they made?

4) Why would you use them?

5) Would you use all of them?

6) How could they become harmful?

7) Who determines if they are useful or harmful?

8) Which could be made by you?

(All of these objects are designed to show how man has tried to improve or increase his powers for the purposes of being able to act as steward of his environment.)

The teacher may select other significant objects.

ACTIVITY 2:

To aid the pupil's understanding of the degradability of paper, collect several different kinds of paper. For example: facial tissue, note paper, newspaper, a page of a slick magazine and a paper towel. Cut a sample from each to use for identification. Trim so each piece is the same size. Collect several jars that are the same size and have lids. Place equal amounts of water in each jar. Place a different kind of paper in each jar. Tape samples on the outside of the appropriate jars. Label the lids. Replace the lids, and shake each jar 20 times. Compare the paper inside with the sample taped outside. Leave the jars undisturbed for one week. Then shake each again 20 times. Compare. Which kind of paper changed the most. The least? How did they change? Discuss why degradability is relevant to solid waste treatment and disposal.

ACTIVITY 3:

Have an Ecology clean-up day at school. Make a list of all the common kinds of waste found and how it could be re-used. Contact companies which offer bonuses for their used containers when returned in quantity. Interested students can turn this into a money making project.

ACTIVITY 4:

Students should find articles, pictures or models of objects which can be recycled. For example: trash into glass tubing and building tiles; cans into reprocessed tin and aluminum; used newspapers into clean newsprint, etc. Make a bulletin board or scale model of the things students find. Discuss recycling.

1) Why does society need to recycle basic matter?

2) How can we encourage people to help with recycling? (Returning deposit bottles and cans for example.)

ACTIVITY 5:

To stress the importance of individual responsibility to use our water resources wisely, divide the class into groups that will investigate how much water is used in their houses. Have each group research their questions as listed below:

Group 1 - How much water does an electric dishwasher use?

(Might have to write several companies or interview dealers in town.)

How much water does a person use when washing dishes by hand?

(The students will have to devise a method of measuring water used to wash dishes.)

Group 2 - How much water does an electric clothes washer use?

(Write to companies and interview dealers.)

How much water would it take to wash clothes by hand?

Group 3 - How much water does a person use when taking a shower?

How much water does a person use when taking a bath?

(Let students determine a method for collecting their data.)

Group 4 - How much water does it take to wash an average size car by hand? How much water is used to wash a car at an automatic carwash? (Students will have to interview carwash owners.)

Group 5 - How much water do we use when we flush the toilet? How much water is used when we brush our teeth or wash our hands?

Record results of each investigation on the chalkboard.

ACTIVITY 5: (Continued)

1) From the results of each investigation determine how much water can be saved.

2) What things that were investigated are not necessary uses of water?

3) Did different washing machines and dishwashers use different amounts of water?

4) If dishwashers and clothes washers were labeled with the amount of water they use, which ones would you buy?

5) How can we get these machines labeled with their water usage rates? (Send a letter to Ralph Nader or your Congressman.)

6) How do you read a water meter? (Check with your local water department as meters vary.)

7) Could you use the water meter as a measuring device for figuring our how much water we use in a day, a week, or a month? (Yes)

ACTIVITY 6:

Copy the two charts below. Then keep this sheet with you for a day. Mark it each time you use water. You can use the back of this paper to do your figuring.

Remember this is an estimate, not an exact measure of how much water you use. Therefore you can use the average amount given in the second column when you do your figuring. For example if you get six drinks of water a day, you would estimate 6 x ¼ - 1½ gallons. (Note: the averages assume you let the water run to get hot or cold. You wouldn't for example, drink ¼ gallon of water each time you get a drink, but that much would run from the faucet if you let it run to get cold.)

Water You Use

How you Use It	Average Amount for one Use	Put X Below for Each Use	Total
taking a bath	30 gallons		
taking a shower	20 gallons		
flushing a toilet	3 gallons		
washing hands or face	2 gallons		
getting a drink	¼ gallon		

ACTIVITY 6: (Continued)

How You Use It	Average Amount for one Use	Put X Below for Each Use	Total
brushing teeth	¼ gallon		
other	you estimate		

Some water is used for the good of everyone in your family, such as water for cooking and cleaning. This chart can help you estimate your share of that water. Suppose, for example, that there are five people in your family. If you estimate that water for meals, cleaning and other family uses equals 100 gallons, your share is 100 ÷ 5 = 20 gallons.

Water Your Family Uses

How You Use It	Average Amount for One Use	Put an X for Each Use	Total
washing dishes for one meal	8 gallons		
cooking a meal	5 gallons		
using automatic clothes washer	32 gallons		
other	you estimate		

ACTIVITY 7:

Set up a panel discussion on various ways of improving the quality of water. Research the following: water harvesting; reduction by evaporation; curbing material use; separating solids; or recycling water to purify it. Have the panel find various methods which would add to our water supply. (for example, distillation of sea water, etc.)

ACTIVITY 8:

Use the following survey to estimate your community's water needs.

1) What is the name of the person interviewed and what is his position?

2) Where does our city get its water? Is any rainwater collected?

ACTIVITY 8: (Continued)

3) Why do we get it from this source?

4) Have we ever had a water shortage? If so, when? Why did these shortages occur?

5) What action is or should be taken during a water shortage period?
   (a) by the city
   (b) by the industries
   (c) by individuals

6) Are there any other sources where the city could obtain water?

7) What plans have been made to meet the future water needs of the community?

8) Is the city recycling any water? Are there any plans to do this in the future? Why or why not?

9) Does the city supply water to any large industries? If so, how many millions of gallons per day go to each industry?

10) How much water is distributed daily to the residential areas of our community?

11) How is the water distributed to our homes?

12) What is the normal water pressure in the system? How is this pressure created? What size pipes are used?

13) Do we have reservoirs and water tanks? If so, where are they? How large are they?

14) Is our water treated prior to being put into the distribution system? If so, what is done to it and why? Can you draw us a diagram of this operation?

15) Does our city have an adequate water system? How could it be improved?

16) Are there any articles or reports which we can study in more detail?

17) What is the present price-rate structure for city water? Do you have different rates for residential and industrial uses? If so, what is the difference and why is this the case?

ACTIVITY 9:

If the only energy available to you were solar energy, how could you use it to collect water? Do the following experiment:

1) Choose a sunny day for your experiment.

2) Collect your materials. You will need: (a) light plastic sheeting about 4 ft. square; (b) Cactus chunks or any moisture collecting

ACTIVITY 9: (Continued)

plants; (c) jars or cans; (d) shovel

Now:

1) Dig a hole about 3 ft. across and about 1½ - 2 feet deep in a sunny and moist place.

2) Place the cactus chunks in the hole.

3) In the bottom of the hole also place the jar or can.

4) Place the plastic over the hole and weight down the edges with rocks.

5) Place a stone in the middle on top of the plastic sheet above the approximate center of the receptacle.

6) Moisture from the soil or plants will be drawn up by the heat of the sun. The cooler air above the plastic will result in condensation - the moisture of which will collect and run down the plastic to the lowest point where it drips off into the container. 1-5 pints of water may be collected in a day.

ACTIVITY 10:

Have students write a story about how it would feel to be able to get only 1-5 pints of water a day and what you would do with this small amount of water.

ACTIVITY 11:

Have students keep a scrapbook of current events pertaining to solutions to environmental problems facing the world today. Pick one day per week for the sharing of these and also monitor a group discussion on their opinions to the probability of these environmental solutions.

ACTIVITY 12:

To give the students an understanding of the complex factors which determine environmental attitudes, investigate what makes up a voter profile. (Party affiliations, sex, ethnic background, age, section of the country, etc.) Select the information to be collected and environmental questions to be asked. (The ecological survey could be given as stated in Activity 13.)

Divide up the town (get into the idea of random sampling), using the voter registrar's list(s). Interview the chosen areas, keeping accurate records of how many eligible voters were at home, willing to answer the survey, etc. As a class, compile the data using graphs and charts. Possible divisions:

ACTIVITY 12: (Continued)

(a) how many of the total surveyed fall into such catagories as; 1) Republican or Democrat or Independent; 2) male or female; 3) under 21, over 21, and so forth.

(b) determine what the overall environmental attitude is.

(c) try to break down the environmental attitude into political catagories--i.e., how many democrats favor mandatory pollution abatement devices on cars as opposed to republicans and independents?

Anticipating the next local, state, or federal election, try to predict the voting results in the area surveyed (and try to select an election with a clearly defined environmental issue.)

ACTIVITY 13:

Use this survey to gather data on ecological attitudes.

	YES	NO	MAYBE
1) Would you be willing to purchase returnable soft drink and beer containers to the exclusion of no deposit--no return? (Plastic & glass)	___	___	___
2) Would you be willing to limit your purchase to "no phosphate" detergents until an acceptable substitute is found?	___	___	___
3) Would you be willing to vote for bond issues to construct efficient sewage disposal systems? (This means an increase in taxes!)	___	___	___
4) Would you like to see more of our "natural wilderness" area set aside for the sake of preservation for future generations?	___	___	___
5) Would you be willing to accept a higher priced but lower quality fruit and vegetable at your local supermarket at the expense of a marked reduction in the use of pesticides by the growers?	___	___	___
6) Would you be willing to sort paper wastes each week (newspaper, magazines, and others) in order to facilitate ease of pickup for recycling? (This means tying up the bundles)	___	___	___
7) Would you be willing to pay higher prices for products so that industries can install pollution control devices which would eliminate or reduce pollution of air, land, and water? (The industries will not absorb the costs without passing it to the consumer.)	___	___	___
8) Would you be willing to reduce or eliminate as many of your paper products as possible by doing the following?			
Use sponge or cloth instead of paper towels?	___	___	___
Use washable diapers, not disposable?	___	___	___
Use washable glasses and plates instead of disposable ones?	___	___	___
Use cloth napkins instead of paper?	___	___	___
9) DO NOT LITTER! This is the easiest pollution to stop.	___	___	___

ACTIVITY 14:

Economic considerations often outweigh environmental considerations.

To enforce the above statement, have a city planner come into the class and discuss the following:

1) Why zoning is required.

2) How zoning an area is determined.

3) How to re-zone an area.

4) A basic philosophy of the city planners - where and who determines the priorities.

Then using information such as maps, charts, aerial photographs, etc., the students will know their community.

a) Residential locations

b) Commercial locations

c) School locations

d) Recreational locations

After a complete study of what is, they will, realistically, develop their community based on both economic and environmental considerations.

ACTIVITY 15:

Because many homeowners in suburbs keep their property tidy, they destroy the natural habitats of birds and small animals. Clearing brush, removing trees and keeping grass cut short make it difficult for animals to survive. In cooperation with a shop or woodworking class, have your students provide nest boxes or other havens for birds and mammals to use on home and school property.

Discuss these points:

1) How will the increasing number of housing and commercial construction projects affect plant and animal communities?

2) How will this influence our lives?

3) How can the benefits of the above activity be repeated on a much larger scale to perpetuate plant and animal life?

4) What sacrifices will man be forced to make in order to minimize his impact on the natural environment?

5) How do you feel about encouraging farmers to leave hedgerows, tree boundaries around fields and plantings for wildlife feed, as is done by the agricultural stabilization and conservation committee? (The farmer is partially reimbursed for the practices.)

ACTIVITY 16:

Work in groups of 5 and plan a school plant exactly as you would like your school to be. Keep in mind the things that are important to students. Give students a budget to adhere to and remind them of electricity, water and building maintenance costs. Discuss another school you have been to. What are the similarities and differences between the two schools. Discuss the ways you could reduce operation costs. Consider the following: solar energy for heat and air conditioning, trees on the grounds for shading, windows for ventilation instead of an enclosed building, faucets that cut off automatically, frosted windows, recycling stations placed around school grounds, etc...

ACTIVITY 17:

Have students prepare a large attractive bulletin board. Cut large letters for this title: CONSERVE HUMAN RESOURCES. Make a second bulletin board with this title: HUMAN BEINGS - THE MOST IMPORTANT NATURAL RESOURCE. (Write underneath: Wise, Good, Healthy People Working Together for a Better World Will Mean A Better Life for Everyone.)

1) What are human resources? Accept the pupils' definitions. Let them discuss them a few minutes. Clarify terms if needed.

2) What is the responsibility of everyone in a democratic society? (Accept his share of the responsibility.)

3) How can you accept your share of the responsibility?

4) Is "wasting time" a waste of human resources? Of yours, or another's, or both?

5) Recall your experiences and activities for the past two days. How much power do you suppose was wasted?

6) What are some of the things people can do to insure against waste of human resources? (From the reading and discussion, this type of response could be expected.)

   a) Find medicines to prevent and cure disease.

   b) Practice good health and safety habits.

   c) Have good living conditions for everyone.

   d) Study, work, and play wisely.

   e) Live useful lives; help the needy, cooperate; work always to make the world a better place.

Let the class divide into two groups. One group can complete the big bulletin board titled CONSERVE HUMAN RESOURCES. From their reading, research, and discussion, they will probably list something like this:

   a) Develop healthy habits early in life.

ACTIVITY 17: (Continued)

b) Learn about the rights, privileges, and responsibilities of citizens.

c) Use leisure time wisely.

d) Learn more about self and environment.

e) Cultivate attitudes of acceptance and understanding among human beings.

The second group can make a bulletin board: WHAT ARE HUMAN RESOURCES?

Healthy body
Healthy mind
Human potential

Special talents of people
All talents of people

Ask each child to make a large key from strong paper.

1) What is the key to conservation of human resources? Name the key: Equal Educational Opportunity

ACTIVITY 18:

In preparation for the lesson the teacher might bring to class a patchwork quilt. Pin on quilt this caption: Waste or Use. Give pupils the opportunity to write for about 2 minutes on what they think the quilt teaches.

1) Does bread come from a store, from a bakery, from a plant, or from the soil? Explain.

2) Do "fat cities" come from a lean countryside? Explain.

3) Think of how your homes are heated and of the sources of this heat. Explain.

4) What is "the lifeline" of making resources available or usable to you? (Transportation) Explain.

5) What natural resources have we included?

ACTIVITY 19:

Have each student keep a list of the goods and services that their family purchases during the next week. In class have the students analyze their lists and determine what environmental damage was done to produce each of the items that they listed. You will have to help them determine the damage to the environment for some of the items they purchased.

1) Do any of the things your family purchased cause more damage than

ACTIVITY 19: (Continued)

other items?

2) Could you live without the more damaging items?

3) When you buy something that has caused environmental damage to produce, is the damage your fault or the manufacturer's fault?

4) Do you frequently have choices between items that will serve the same function?

ACTIVITY 20:

Going to the woods for a picnic seems like a fine idea. Yet, with our bad habits of "disposable everything", we may find ourselves with no woods left because we've used them all up for our "paper picnics." It has been estimated that one of our hamburger giants in this country uses approximately 315 sq. mi. of forest per year for its wrappings alone! Have students construct a "non-disposable picnic" utilizing as many returnable items as possible. Perhaps this could be worked into a field trip lunch.

ACTIVITY 21:

Build a "mini" sanitary landfill in the classroom. Materials needed:

1 large container with lid
1 tea bag
1 styrofoam square
1 piece plastic
1 paper square
1 aluminum foil square
1 swatch quilted cotton
1 piece of clear plastic wrap
1 square wax paper
1 piece of bread
1 coca-cola cap (metal)
1 swatch synthetic fiber (polyester)

Fill the jar with soil, loosely. Insert the materials along the sides of the jars where they can be observed. Label (from the outside) the materials included. Keep the labels small so they will not obscure the materials. This represents a sanitary landfill, a method of garbage disposal favored by many city officials today.

Keep an account of the changes occuring in the "mini-fill" in the following manner.

Once a month observe the following materials and record your observations.

Materials	Months	Changes Observed
Tea bag		
Styrofoam square		
Plastic		

ACTIVITY 21: (Continued)

Materials	Months	Changes Observed
Paper Square		
Aluminum foil		
Quilted cotton		
Plastic wrap		
Wax paper		
Bread		
Coca-Cola Cap		
Polyester fiber		

Follow-up questions:

1) Which type of material has changed the most?

2) Which type of material has changed the least?

3) Which type of materials are just beginning to change?

4) Which types of materials have not changed at all?

5) Which type of materials will take the longest to change?

6) Which materials would be more suitable for packaging goods or garbage?

ACTIVITY 22:

Make a list of items students could do individually which would affect the environment. Some suggestions are:

1) Save water. Put a brick in toilet tank. Fix dripping faucets. Wash full load of clothes and dishes

2) Turn lights out.

3) Walk or bicycle more often.

4) Buy beverages in returnable containers.

5) Pick up more than just your own litter.

6) Use both sides of paper.

7) Decline excess packaging.

8) Set air-conditioner higher and set heating system lower.

9) Don't molest wildlife.

10) Don't plan toward large families

11) To save energy, switch over from electric to gas when cooking and other home tasks requiring appliances.

ACTIVITY 22: (Continued)

12) Use plain white paper for napkins and toilet tissue, etc.

13) Practice home gardening.

14) Make a compost pile out of decomposable garbage.

15) Frost free refrigerators (especially with icemakers) use much more energy.

16) Use cold water in washing most clothes.

17) Use available mass transit.

18) Be conscious of neighborhood animals, especially if they begin to diminish.

19) Be aware of conservation agencies in your area.

20) Form/join awareness groups.
   a) Audubon
   b) National Wildlife Federation
   c) Conservation
   d) Sierra Club
   e) Citizens Action Against Pollution

21) Write to a congressman or senator. Ask for information on their level of government and what is being done to solve problems facing the environment.

22) Pick a conservation issue. Determine through all levels of government and education, what it takes to solve the problem.

23) Watch on T.V. or attend a local session of city council, school board, or city commission. Write a report on the issue discussed and the procedure followed.

24) Find out why lighting is used on billboards and if it is needed. Discuss this in class.

ACTIVITY 23:

In the form of cartoons, have the students draw a series of pictures showing a man in the midst of doing something worthwhile to save some aspect of his environment. Each student should draw at least ten different ideas.

ACTIVITY 24:

Have the students write down three ways that they spend money for consumable goods. Compile this into a comprehensive list to include as many different goods as possible. Then have the class take each item and determine the most pollution-free form of the item. Example: cans vs returnables; bulk vs

ACTIVITY 24: (Continued)

individual wraps; frivolous packing vs reasonable packing.

ACTIVITY 25:

If we are ever to "save the environment," we will have to consider modifying our present life-style. Assuming this to be a necessary condition, which of the following would you be willing to do without? For how long?

1) Air conditioning

2) An automobile

3) An electric razor

4) New wooden furniture

5) Electricity

6) Alligator purse

7) Seal-skin coat

8) Diamond rings and necklaces

9) Electric can opener

10) Dishwasher

11) Frost free refrigerator

12) Trash compactor

13) Toaster oven

14) Garbage disposal

15) Electric Christmas tree lights

ACTIVITY 26:

Most teachers at this school drive to work - very few probably car pool. Certain information is needed to arrange car pools. What is it and how do we get it?

Determine a method of gathering information needed from teachers (survey, interview, etc.)

Determine what information is needed in order to arrange car pools (Teacher's names and addresses, miles driven from home to school, make of car, mpg, if they do ride with someone else).

ACTIVITY 26: (Continued)

Make a list of teachers at your school. Use your method of gathering information to get answers to your questions.

1) Look at your survey results. Which 5 cars seem to get the best mpg? Find some similarities among these cars.

2) Car pooling involves people cooperating with others. What habits or other activities of teachers should be considered when organizing car pools?

3) How do the car pools of others affect you today? Tomorrow? Ask 3 drivers you know how they feel about car pools and why they feel that way. Are they looking toward tomorrow?

4) Do the children in your neighborhood ride in car pools? (School, outside recreation, church, etc.)

5) Do you live in an area where city bus service is available? How can using this service save resources? Human energy?

ACTIVITY 27:

How much of the refuse from your school cafeteria can be recycled? How much money could be saved by this action?

Paper, aluminum foil, bottles and cans are natural resources that are a part of your lunch everyday. How many students eat lunch each day? Try to make an estimate of how much paper, aluminum foil, cans and bottles are used each day. How much money is this "trash" worth?

*Hint: Weigh 1 milk carton, then multiply by number of cartons. Weigh the empty class trash can, then weigh the full class trash can and subtract to determine class paper available for reuse.

FACTS
Aluminum . . . . . .15¢ per lb.
(10 cans per pound)
Paper . . . . . 05¢ per lb.
Glass. . . . . .06¢ per lb.

MATERIALS NEEDED - Scale capable of measuring ounces or grams. Scale capable of measuring pounds or kilograms.

Multiply the total number of students eating lunch in your cafeteria by the total number of recyclable items on their trays.

Now think of all of the students eating lunch everyday throughout America.

Report on ways paper, cans and bottles can be recycled into new usable items.

ACTIVITY 27: (Continued)

Bring in examples of recyclable items being discarded in the cafeteria at school. How long would it take to save enough money by selling this "trash" to buy a minibike? How much paper was used in this class alone or just thrown on the floor? How much money was it worth?

ACTIVITY 28:

The "average" American throws away 4.5 pounds of trash and garbage each day. By the end of one year, this adds up to about one ton of trash per person. The population of the United States is about 215 million. How many tons of trash are thrown away each year in the U.S.?

ACTIVITY 29.

Divide the class into groups of 2-4 students. Ask each group to select a "have" or "have not" country (U.S.A., West Germany, Argentina, etc., vs India, Libya, Peru, etc.) Using information secured from the United Nations or other reference sources, ascertain the average daily caloric intake of poeple in "your" country. Get information, if possible, also, about the country's use of petroleum, clothing, and recreational activities.

Place information secured on a large outline map of the world and discuss the causes of the enormous variation. What countries are below recommended levels? Are any above? Why? What responsibility, if any, should the "haves" assume for the "have nots"?

ACTIVITY 30:

Select an environmental problem facing your area. Now with your class and their artistic talents, invent a CREATIVE campaign. Campaign to rally public opinion. List what you can do; do it!

Here are some ideas:

Festivals	Public meetings
Displays	Posters, collages, junk art
Demonstrations	Letter writing, songs, poems
Radio coverage	Lapel buttons

ACTIVITY 31:

Divide the class into groups with these directions:

Search for ads (print, radio, TV, billboard) which your group judges to be potentially damaging to the environment.

Prepare a report in which you carefully document CLAIMS made in the ad which might be regarded as potentially dangerous to the environment.

ACTIVITY 31: (Continued)

If the ad rests exclusively on an APPEAL, develop an argument which reveals its potential environmental consequences.

Create a counter-ad - - one which reveals the environmental hazards of the product, service, idea, or person. The ad can be printed and illustrated, or the ad can be tape recorded for radio, or the ad can be scripted for TV.

Submit the report and the counter-ad to the company which makes the product, performs the service, or is promoting the idea or person. A letter should be attached, explaining that your group is concerned about the environmental consequences of the product, service, idea, or person in question. Wait for a response.

Depending on the kind of response you get, consult your teacher about what additional steps, if any, your group might take.

ACTIVITY 32:

After the next election, find out which politicians have left their signs up around your city or town. Contact them and ask them to take the signs down. For more ideas on ways to limit road signs, write for a free booklet to: California Roadside Council, 2636 Ocean Avenue, San Francisco, California 94132.

ACTIVITY 33:

Listed below are some values. Have students make a list of their own and then have them write how they could take action on it.

1) Prosperous life.

2) Making a contribution to the world.

3) A peaceful world

4) Cleanliness

5) Helping others

6) Creativeness

7) Equal opportunity for all

8) National security

9) A world of beauty

ACTIVITY 33: (Continued)

10) Ecology

11) A healthy body

12) Socal recognition

13) Others _____

VALUE	HOW I ACT ON IT	HOW I COULD ACT ON IT
Example: Ecology	Take glass bottles to a recycling center weekly	Ride my bike to school instead of mom or dad driving me.
1.		
2.		
3.		

ACTIVITY 34:

Business and industry are very sensitive to public criticism. Select local companies which are not making an attempt to keep plant areas neat and landscaped. Have students write to the president of the company. Share letters and responses with class and with others.

ACTIVITY 35:

You are a Madison Avenue advertising executive. Prepare a full-scale advertising campaign for the concept of ECOLOGY, a "new idea" being promoted by local, state and federal governments. Your main goal is to sell this idea to the public. Make illustrations and write slogans for the ecology campaign.

Additional activities for objectives 1,3, and 4 can be found in the Environmental Field Investigators Water Quality Soil and Land Use guide for teachers; Alachua County School Board, 1975.

OBJECTIVE:

To identify ways man controls, disrupts and promotes nature and the distribution of organisms.

ACTIVITY 1:

In order to begin to develop an understanding of ways man controls, disrupts and promotes nature and the distribution of organisms, students should become aware of the animals, plants, water, soil, air, etc., of an area.

1) Walk or ride somewhere.

2) Jot down a few observations about where you are, what kind of animals live there, what kind of plants live there, what condition the water is in (take a sample and test it when you get back to the room), what type of soil is there, what the pH of the rain in that area is. Is there any evidence that man has been there?

3) Compare notes. This can be as individuals or in small groups (small teams might work on a group list of representative observations based on their own criteria). A blackboard or chart board for people to post their "findings" is very helpful--but a small group can have a fine rap session just sitting on the grass.

4) If you choose an area nearby, the students could revisit the area and keep a record on the area and what they find.

ACTIVITY 2:

In order to induce the public to buy one product in preference to another, proprietors advertise. They send out brochures, put ads in the daily newspaper, hang signs in their windows, install neon lights over their doors, and erect billboards along the highways. So it follows that the greater the population, the more business and industries will be established, the greater the competition, the more extensive the advertising, and hence, more billboards result.

What do your students think of billboards? Do they like them? Do they think they detract from the environment or haven't they paid any attention to them? Ask them where they see most of the billboards. Are they along country roads, main highways, or city streets? Why were these locations selected? What are the rulings for advertising in this manner in your locality? Can anyone erect a billboard anywhere he chooses? Have your students perform the following activity to answer some of these questions.

ACTIVITY 2: (Continued)

Materials (per team of 2 or 3 students)

local and state zoning ordinances for advertising
camera
map of area
notebook and pencil

Materials (per class)

large sheet
woolen yarn
needle and thread
glue and straight pins
cardboard
marking pens

Methods

1) Take a ride or walk around town and photograph each billboard you find. Mark the location on your map. Record the name of the advertising company that owns the billboard.

2) Compare your information with other teams in your class.

3) Construct a mural representing your local map. Use a sheet for the background and woolen yarn for the streets. Sew the yarn in place. With a marking pen, write the street names on cardboard labels and pin or glue them in place. Glue your photographs of the billboards along the streets where they are actually located on the original map.

4) While some students are working on the mural, a team of 2 or 3 students can visit the Town or City Hall and consult with someone in the Town Planning and Zoning Office regarding advertising regulations for billboards. Look up and read the appropriate ordinances.

5) A second team can write to your congressmen and ask for copies of the Highway Beautification Act. Also ask them to bring you up-to-date on the Senate bill (S1442) authorizing $15 million for pilot programs to remove billboards from highways.

6) Another team can contact the company or companies that own the billboards and ask them how land and permits are obtained for this purpose, and also, how they contact customers. What would happen to them financially if they were no longer allowed to erect billboards.

7) Still another team can call, or better, visit the companies that are advertising on the billboards. Ask them in fact, if they think that this kind of advertising is really profitable. Would they agree to not advertise in this manner if all the other companies likewise agreed?

8) Gather all the information together and discuss it with the whole class. Should billboards remain or be removed? Are the advertisers complying with local zoning ordinances? Are they detracting from the beauty of the area? What are the economic implications if all billboards were to be removed? What Federal legislation is now in force? What action, if any, can or should be taken by the class?

ACTIVITY 3:

As a population increases, its effects on the environment become more pronounced.

* Resources become stressed

* Individual freedoms and choices become limited

* Living costs and taxes increase

Increasing populations stress food supplies and resources at a faster rate than the population grows because each new generation demands a higher standard of living than its predecessor.

As a population expands it approaches a limit known as the carrying capacity of the environment. The environment is only capable of supporting a finite number of individuals and, if that capacity is exceeded, the environment will not supply the needs of the surplus individuals and they will die. When the population levels are near the carrying capacity of the environment, individual members of the population will receive only their minimal requirements for life. This fundamental ecological principle applies to man and also to the quality of life that we enjoy. Our planet has finite resources and as the population expands those resources will be distributed to individuals in ever decreasing allotments. Thus, as man's population grows, his standards of living will be reduced.

Population increase or decrease may be calculated as the difference between birth rate and immigration, and death rate and emigration.

Discuss the terms found in the concept with your students. Do not worry about specific definitions of the terms, but look for examples that would demonstrate the meanings.

1) Birth rate - the number of organisms born per unit of time. The number of children born in your city or other cities in Florida in 1975 would indicate the birth rate for 1975.

2) Death rate - the number of organisms that die per unit of time. The number of people who died in 1975 would indicate the death rate.

3) Immigration - the movement of organisms into an area; the people who move to Alachua County to live.

4) Emigration - the movement of organisms out of an area; the people who move out of Alachua County.

Ask students for examples of each of these terms; then ask them what would happen to Alachua County if the death rate decreased and immigration increased. (The population would increase.) What are some of the dangers of overpopulation? (Increased pollution, lower standard of living, crowding, accident and crime rate go up, taxes increase, slums, etc.)

ACTIVITY 3: (Continued)

In order for a population to remain stable, the birth and death rates must be equal. How would the following things affect the population of a town?

a) The Family Planning Council encourages couples to have planned pregnancies. (If each couple had only 2 children, this would result in less than Zero population growth and a stabilization of the growth rate.)

b) A new maternity unit is added to the hospital to handle special emergencies and provide better care for mothers and newborns. (Decreased infant mortality and maternal death due to delivery will cause a rise in the population rate.)

c) A drug is discovered that will cure many forms of early detected cancer. (Once again medicine devises a way to reduce the death rate. Unless comparable steps are taken to reduce the birth rate, a population increase will occur.)

Now consider other types of populations. Why don't animal populations reach the over-crowded conditions that man faces in his environment? Consider the effects infant mortality, maternal care, predation, and man's technology would have. (Many of the young die or are killed before reaching maturity in animal populations because maternal care is not always as extensive as in humans. Medicine has produced many drugs and techniques which allow people to live longer. Animal populations have no such method of lengthening life. Certain phenomena not completely understood help control animal population, such as the mass suicides of lemmings when food and space are short due to over-crowding. Man often hesitates to control either his birth or death rate because of religious or moral reasons.)

ACTIVITY 4:

Line a shoebox with aluminum foil or plastic. Fill the box with dry sand. Have your students capture 10 ant lions from dry areas around the campus. Place the ant lions in the shoebox environment and allow them to build their cones. Add a few ants as food. After a day or two, add 10 more ant lions. Continue adding ant lions. Provide an abundance of food to the ant lions. Keep a data record of the original cone diameters and the changes that take place in cone size. Discuss the concept of territory and similar effects in human populations. What happens when the food source is diminished?

ACTIVITY 5:

Members of a population tend to exhibit definite spatial distributions.

Obtain a road map of Florida. Using all the keys available on the map, try to make some generalizations concerning the population densities in Florida.

1) If you draw a line 5 miles inland from the edge of the sea, what percentage of the population would live in this narrow strip around the state?

ACTIVITY 5: (continued)

2) Why do people concentrate in this area?

3) Ecologically, is this the best place for them to live? Why or why not?

4) Why have the Orlando, Tampa, Jacksonville, and Miami areas grown so large? Is this a good thing?

ACTIVITY 6:

The population of the U.S. has changed from a rural one to an urban one. In 1910, 7 out of 10 Americans lived on farms, and in 1960, 3 out of 10 lived on farms. Today, only 2 out of 10 live on farms.

1) What caused the movement?

2) How did life change for man after the movement to the city?

3) What environmental changes had to occur to accomodate man?

ACTIVITY 7:

Have students research the territorial behavior of any or all of the following animals.

Black Bear

Cougar (Florida Panther)

Warblers

Deer

Eagles

Osprey

Ant Lions

Have the student try to answer these questions:

1) Why do these organisms have territories?

2) How do they protect their territories?

3) If there were only room for 50 animal territories in an area, what would happen if 100 were placed in the area?

4) Is man a territorial organism?

5) How does he protect his territory?

6) What happens to man if his territories become overcrowded?

ACTIVITY 8:

Man has modified his environment to the extent that some of the processes of natural selection no longer act on the population.

Discuss phenol ketonuria, hemophilia, or other types of inherited diseases that have in the past kept these people from reproducing.

1) Do these people pass their diseases on to their children: Will the number of these people increase? Why?

2) What has modern day medicine done to the composition of our population?

3) Do you think resistance to disease is related to heredity?

4) What would happen to our population now if we had to restrict medical assistance? Can we afford to give up medicine now?

5) Why did the populations in Africa and South America increase so rapidly after modern medicine was introduced? What would happen to those populations if we removed the medical assistance?

Discuss correlations between the following terms:

caged man	urban
population	stagnant air
tenement	garbage
job pressure	overusage
peer pressure	depression
rush hour	suppression
traffic	aggression

6) By contacting a drug rehabilitation program, try to answer the question, "Is the frequency of narcotics addiction greater in big cities?"

ACTIVITY 9:

Mark off an area 6 feet square in the classroom, suggesting that this represents the environment. Have one student (students representing population) enter the space. At intervals of one minute, add students to the area in the manner of a geometric progression (representing population growth: 1, 2, 4, 8, 16, 32, etc.). No student should be in contact with any other student inside the area. Continue until no more students can enter the area. (Note that, as the population of this area increased, each student had less space available for himself.)

1) What percentage of the class was able to enter the area?

2) How long did it take to fill one-half the area? To fill the entire area?

3) Suggest some additional deprivations that individuals would suffer under actual conditions of high density.

4) Is there a limit to what the world population can safely become?

ACTIVITY 9: (Continued)

5) Do you think tension increased as the population grew? Why?

6) Does this experiment accurately depict the real environment: Why not? Where would the individuals get their food if they were standing on all the available ground? How much space does each person really need to satisfy his basic needs?

7) What kinds of psychological problems would the individual face as the land availability approached the minimum required for each person?

ACTIVITY 10:

The basic needs of men and animals seem to be approximately the same. These needs include a suitable living area, freedom from stress, territory, and a stable reproductive process. Have your students consider the plight of a caged animal. Few animals readily adapt to this condition. Some reference study or a visit to a zoo will reinforce this understanding. Discuss a "caged" man. Such things as job pressures, tenement housing, crowded freeways, busy shopping centers, and overused recreation areas may serve to trap a human being.

1) What other factors can you think of which tend to "cage" man?

2) What influences an animal in its selection of a home territory?

3) Do human beings consider the same things when seeking a place to live?

4) Is the environment compatible with the needs of man? Explain.

5) What adjustments or avenues of escape can man exercise to insure his well-being and survival, that lower animals cannot make or use?

6) How do rural, suburban and urban environments each suit or thwart the needs of men?

ACTIVITY 11:

Remove one chair each day from the class and note the student behavior as competition increases for the remaining chairs. The chairs would have to be removed before class and unknown to the students. A small corps of close-mouthed students might act as statisticians for the experiment. However, the resulting antagonistic attitude in the dechaired group will serve as testimonial for this concept, regardless of accurate records.

1) Is this competition for space a real phenomenon? (Yes. Competition for land, parks, lots to build on, etc., is increasing every day.)

2) Do you think national and state parks will ever regulate attendance on the basis of a lottery? (Many already do and in the next 10 years several of our national parks will go on this system.) Is this competition for space?

ACTIVITY 11: (Continued)

3) Can you think of any areas where man competes for the use of land such as residential vs. agricultural? (There are many areas like this all over the country.)

4) In Europe there are cities where people have to wait to get a place to live before they get married. What do you think is happening to the couples average age at the time of marriage? (Yes, it's going up.)

5) As the competition for space increases, what do you think the future will be like? (Try to answer this question accurately without going too far out. Maybe the students could write a paper on this.)

6) What will happen to the cost of space as it gets scarce? (Go up.)

ACTIVITY 12:

Tell the students they all own 5 feet of the beach. Have them write a paragraph on what they would do with it. Then tell them people are moving into the area and 2 feet of land will be taken away from their five.

ACTIVITY 13:

Have a group of students compose a skit with the basic theme "Too Many People Live Here". Have them include the problems in everyday life that they encounter (competition for food, materials, space, water, etc.).

ACTIVITY 14:

Have students learning notehand and/or shorthand go out on campus and write paragraphs concerning what the campus needs in the form of environmental improvements. Then have the class transcribe the paragraphs by using typewriters. The notes can then be sent to the principal or student government so that action can be taken on the suggestions.

ACTIVITY 15:

Have your class prepare a series of short messages concerning the campus and school environment. Read these over the school public address system during morning and afternoon announcements. Try to include action and solutions to problems in the messages.

ACTIVITY 16:

Have your class determine where litter barrels should be placed on the campus. One method for this survey is to have a clean-up day. Pick up all campus litter. Then remove all litter barrels from the campus for two days. Have your students make a litter survey and indicate on a campus map areas containing the most litter. Place the litter barrels in these areas. Clean up any litter that was found at the end of the two day period. Check the campus periodically for new "litter hot-spots" and place barrels in these areas.

ACTIVITY 17:

Organize a week long campus litter pick-up campaign at your school. Keep daily records of the weight of the litter. Challenge other schools to see which school produces the least litter. Have the local newspaper announce the results of the pick-ups. Try to involve as many students as possible. Include rap sessions about ways to stop littering on the campus.

ACTIVITY 18:

Locate the dirtiest air on campus and determine the source of the pollution. Then have the students determine methods of cleaning up the air. Take a 3 x 5 index card and punch several holes along one edge with a standard hole-puncher. Put a piece of clear cellophane tape over the holes. Place the cards in different areas of the campus and school buildings. The sticky surface of the tape should be facing upwards. Allow the cards to remain in their areas for a few days. Choose a variety of areas; near the building, in open areas, under trees, etc.

ACTIVITY 19:

Have your class create a short television presentation that points out campus environmental problems and solutions for these problems. Put the show over the school's closed circuit television network so other classes can participate.

ACTIVITY 20:

Send your students out on campus to find signs of pollution. They should then make a poster that illustrates the type of pollution and the location on the campus. The poster should have a rhyming title such as, "Snoopy is droopy because of pollution". Place the posters around the school so that other students can examine them.

ACTIVITY 21:

Have your students make five minute recordings with portable tape recorders from different areas of the campus. The sound level should be set the same at each location. Try to get recordings during different times of the day. Plot the locations on a campus map. Have the class identify the sounds they hear. Are any areas of campus noisier than other areas? What can be done about the noise in each area? Do the noise levels change during different times of the day? Why? How can shrubs and trees help in softening noise levels?

ACTIVITY 22:

Studies on maintenance costs along roadsides and parks have shown that it costs $.35 to pick up every bottle, can or piece of paper. Send your class around the school grounds collecting litter. Return and compute how much money your class saved taxpayers.

ACTIVITY 23:

Have students collect litter from a measured area on the school campus. Weigh the collected litter. Determine the area of the school campus by pacing the campus perimeter. Divide the area from which the litter was collected into the total area of the campus. Multiply this area number by the weight of the collected litter. This will give an estimate of the total weight of the litter on the campus. If any aluminum cans are found, weigh the cans separately. Have student volunteers count the number of cans along a tenth of a mile of highway. Then estimate the total weight of cans between Gainesville and Jacksonville or Gainesville and Ocala. Find out the current price of one pound of aluminum. What would the value of the cans be? How many airplanes or aluminum boats could be constructed from this aluminum?

ACTIVITY 24:

Have your students collect litter from the perimeter of the campus. The litter should be placed in three piles: Adults, Children, Not Certain. From this point, the litter can be further classified into that from men and women. If possible, classify the jobs or sports in which litterbugs participate. Have your class determine a way to stop litterbugs. Have a local law enforcement agent talk to the class about litter laws. What should have been done with this litter? Why did the people throw down this litter? What would be a short term solution to this problem? Give a long term solution. Show the film "Litter Bug", available through the Learning Resources Center.

ACTIVITY 25:

Obtain a plastic bucket and dig a hole large enough for the bucket to fit into. Fill the bucket with water and you have an instant mini-pond. Have your students observe their pond every few days. In the mornings before school, the teacher should drop waste paper, gum, candy wrappers, apple cores, and other assorted bits of trash into the mini-pond. Let your class "discover" their polluted pond. Ask the class to consider how many times they have contributed to this kind of pollution. What can be done to stop this? How do they feel about their pond being destroyed by people?

ACTIVITY 26:

Through air pollution and other methods, man has the power to change the climate of an area.

Using beakers with sand only and sand/water, compare the temperature differences of the soil over a given period of time.

Beaker A Sand and water

Beaker B Dry sand

ACTIVITY 26: (Continued)

Place the beakers, with thermometers shoved into the sand, in a sunny place and begin recording the temperature changes for several hours.

Compare the temperature changes as the sun beats down.

Record the temperatures at regular intervals and construct a graph.

1) Did you know that in Oklahoma the state's average humidity has been changed due to an expansive reservoir system? (Allows greater amounts of moisture to be placed into the atmosphere. This and the large bodies of water tend to moderate the high and low temperatures.)

2) Does the wetness tend to moderate change? (Yes, the high specific heat of water allows it to absorb large amounts of heat and to release that heat slowly on cold days.)

3) Would draining many of Florida's wetlands possibly affect our local temperatures? (Yes, this alters the heat absorbing characteristics of the land. It will produce higher high temperatures and lower low temperatures.)

4) How does air pollution affect the temperature and wetness? (Air pollutants act as seed crystals on which droplets of water readily form, thus increasing the chances of rain. Since clouds act as blankets, in that they reduce the amount of heat escaping from earth, air pollutants can also cause temperatures to rise.)

5) Do we have air pollution problems in Gainesville? (Yes, in addition to the air pollution we produce locally, an increasing number of days each year bring us pollution from Jacksonville.)

ACTIVITY 27:

Show that high-phosphate detergents accelerate the growth of water plants. Make up a detergent solution by putting 1/2 teaspoon of high-phosphate detergent into about a quart of water. Stir until all the detergent dissolves. (For a list of high-phosphate detergents, see Consumer Reports, September 1970.)

Gather some pond water and some duckweed specimens. (Duckweed grows on top of the water. It has small, oval leaves about 1/16 inch wide. If you are unfamiliar with this plant, perhaps you can enlist the aid of a science teacher.)

Half-fill two 8-ounce jars with pond water. Put about 100 drops of the detergent solution into one of the jars. Label the jar. Put the same number of duckweed plants into the two jars. Do not use more than a few plants.

Put the jars in a warm, sunny place or under a lighted incandescent lamp. (Center the bulb about six inches above the jars.) Check the plant growth five days later and then ten days later. Add pond water when necessary to replace water that has evaporated.

ACTIVITY 27: (Continued)

The duckweed in both jars should spread, but there should be more growth in the jar containing the detergent solution.

ACTIVITY 28:

Show that oil readily spreads over the surface of water and that wind increases the spreading: Half-fill a large pan with water (a baking pan or plastic tray will do). Pour about an ounce of oil into one corner of the pan. (Any lubricating oil will do. Do not use animal or vegetable oil.) The oil will spread out and cover a large portion of the water surface. Now blow on the liquid in the pan. The oil will spread even more. When it forms a thin layer, you may have to look from several different angles before you can see it.

ACTIVITY 29:

Show the effect of oil on feathers. This activity requires several ounces of lubricating oil and two medium-sized feathers, preferably from a sea bird. Dip one feather into water and the other into the oil. Examine them. Let the feathers dry. Then examine them again. The feather that was dipped into water retains its original shape. The feather that was dipped into the oil shrivels up. It is hard to imagine how a bird could fly if its wing feathers were in this condition. The oily feather does not return to its original state.

ACTIVITY 30:

Educators agree that a student learns best from direct, purposeful experiences. A well-organized field trip into the local community is an ideal way to give children an opportunity to use their five senses in the learning process. At the same time, children gain lasting impressions of the causes, effects and the possible controls of pollution. Field trips need not be long or taken great distances from the school. It is a good idea for the teacher to prepare by taking a preliminary trip in order to identify material to point out to students.

A survey walk of the school building and grounds can help you teach students observational skills so that future excursions into the community will be more rewarding. Children can be taught to observe, survey, record, predict, interpret, generalize and conceptualize.

To help children broaden their understanding of environmental concepts, consider trips to zoos, museums, botanical gardens, aquariums or visits to forests, wetlands, lakes, reservoirs. If yours is a suburban community, then visit a city. If you live in a rural area, visit an urban neighborhood. If possible, take a camera and tape recorder with you to document problems for later discussions. Learning about any specific subject will take place only after appropriate and varied experiences.

ACTIVITY 30. (Continued)

OBSERVATIONS ON A POLLUTION WALK

Route of Walk _____

_____

Date _____ Time _____

Weather Conditions _____

Environmental Problems	Observed	Not Observed	Comments
1. smoke from smokestacks, chimneys, burning trash			
2. exhaust fumes from cars, buses, trucks			
3. smog			
4. deteriorating paint on buildings and cars			
5. stained and soot-covered buildings			
6. dying plants and trees near street			
7. people coughing			
8. people using insecticides			
9. eroded banks, hills, lawns			
10. leaking pipes, fountains			
11. dirty streams, rivers			
12. trash in streets, alleys			
13. abandoned cars			
14. open dumps			
15. rats, roaches, dead animals			
16. unpleasant odors			
17. oil spills			
18. junkyards			
19. heavy traffic			
20. crowds			
21. noisy autos, trucks, buses			
22. noisy airplanes			
23. noisy construction equipment			
24. ugly billboards and signs			
25. rundown buildings			
26. broken windows			
27. writing on walls			
28. crowds of people			
29. other			

ACTIVITY 31:

Man has the capacity to make major changes in the environment. Drainage is a man-induced change.

As man induces changes in an environment, he alters the suitability of that environment for the survival of the species present.

MATERIAL:
- 4 gallon jars
- pond water
- 1 sieve
- 1 tablespoon fertilizer
- 1 tablespoon animal waste (can be manure)
- 1 tablespoon detergent
- 3 fish for each jar

Given four samples of pond water, fish, fertilizer, animal waste, and detergent and asked to place one type of material in each of 3 jars (leave one as a control) then to observe the reactions of fish placed in each environment, the student observes and records different reactions to the four different environments stating an inference as to the reasons for the difference in reactions in the environments.

Many of man's activities alter the aquatic environment and can cause the destruction of species in a given body of water. The processes of Eutrophication causes such changes in the species composition of an area. In this case, man speeds up the natural process by introducing excessive fertilizers and human or cattle wastes into a body of water. Obtain 4 gallon jars and fill each of them one half to three quarters full of pond water. With a sieve, have the students gather enough fish so that each jar will have about 3 fish (wild guppies work well). Treat each of the jars as follows:

Jar #1 should be set aside as a control.
To Jar #2 add one tablespoon of some common lawn or garden fertilizer.
To Jar #3 add two tablespoons of animal waste.
To Jar #4 add a tablespoon of laundry detergent.

1) What changes do you observe in the behavior of the fish?

2) Why did some of the fish die? What was the cause of death? (Usually it is lack of oxygen.)

3) What species are taking over in the jars and thereby replacing the fish? (Bacteria, algae, etc.) Do you think it would be as much fun to fish for bacteria as it is to fish for bass?

ACTIVITY 32:

This activity can be accomplished as a class demonstration or as a small group experiment.

Prepare a gel by mixing one package of unflavored gelatin with three tablespoons of cool water. This gel should be placed in a petri dish or some other transparent glass or plastic container (baby food jars work well). Let the

ACTIVITY 32: (Continued)

gel stand uncovered for approximately one hour. Cover the container and place it in a warm dark place. After two days have the students observe the molds growing in the gelatin. Either discuss or have the students answer the following questions:

1) Can you see anything living in the container? (Yes. Fuzzy growths of mold and a few smooth bacteria colonies.)

2) Over a 4 day period, was there any change in the amount of living material? (Yes. The size of the mold and bacteria colonies increased.)

3) Does the living material keep on growing? Why? (No. Eventually the molds and bacteria use up all the nutrients. Other types of molds may begin to take over the gelatin.)

4) Are there any changes taking place in the gel and, if so, what is causing these changes? (Yes. It is becoming more liquid. This is due to the decomposition taking place as the molds and bacteria ingest the gel.)

5) Have you noticed any changes in the odor of the gel? (Yes. The putrid odor is a result of decomposition of the gel by the molds.)

6) Have the molds changed their environment so that it is no longer possible for them to live there? (Yes. Not only did they remove the nutrients necessary for their survival, but they liquified the gel.)

7) Name another organism that changes its environment in such a way that it can no longer live there. (Any organism has this potential. Deer can increase in numbers until they eat all of the food in an area. Man pollutes areas so extensively that eventually he will have to move out of them.)

ACTIVITY 33:

This is an exploratory activity for students. It is not always possible to stop noise by making laws which forbid people to make sounds. Sounds can be softened by muffling or cushioning the object.

MATERIAL: Electric bell
Sponge
Battery
Walls

Hook up the electric bell or buzzer. Start bell, then muzzle it with a sponge. Measure the difference in sound.

Use a wall to muffle sounds. Let students stand on different sides of a wall and very near, then measure difference in noise. Choose other materials to muffle sounds and measure.

ACTIVITY 33: (Continued)

1) Which materials worked best?

2) How are sounds reduced?

3) How do curtains in a room make a difference?

4) How can you reduce noise at home?

ACTIVITY 34:

Materials: Three potted plants (similar)
Record player or tape player
Record or tape

Obtain three similar potted plants, such as geranimums, and place two near a sound source such as record or tape players with high volume potential. (A sound proof music room, if available, would be useful in the experiment.)

Play recorded sound at very high level to the two experimental plants for some specified period, such as one hour per day. Record on the chart or log the length of time per day, the number of days and the condition of the exposed plants compared with the control one. Observe for change in texture or firmness of plant, leaf color, and flower color as the experiment progresses.

Discuss implications of results for human beings or other animals.

ACTIVITY 35:

Obtain a watch and a radio. Listen to the watch tick. Turn the radio on and increase the volume until it is loud. Do not let it become so loud that the sound is uncomfortable to you. Place your ear near the speaker and listen for 5 minutes. Turn the radio off and hold the watch up to your ear. Try to hear it ticking. Can you hear the ticking as easily as you could before you listened to the radio?

ACTIVITY 36:

Sounds have certain properties that can be measured - for example, loudness, pitch and regularity. The higher the decibel rate, the higher the pitch or the more irregular the sound pattern, the more annoying the sound.

Tape record a variety of sounds from different sources on a recorder. Play them for the students. Ask the children to try to identify the sounds. Discuss which ones you consider noise. Why? List sounds that you consider pleasant and those you find annoying.

ACTIVITY 37:

Attach a buzzer or bell to a 6-volt battery with wires so that it will produce a steady sound. Place on a table. Listen to it ring for 2 minutes. Place a layer of sponge between the bell and table. Listen to the loudness of sound now, and compare it with the loudness of the sound when the sponge was not used. Was the sound reduced? Why?

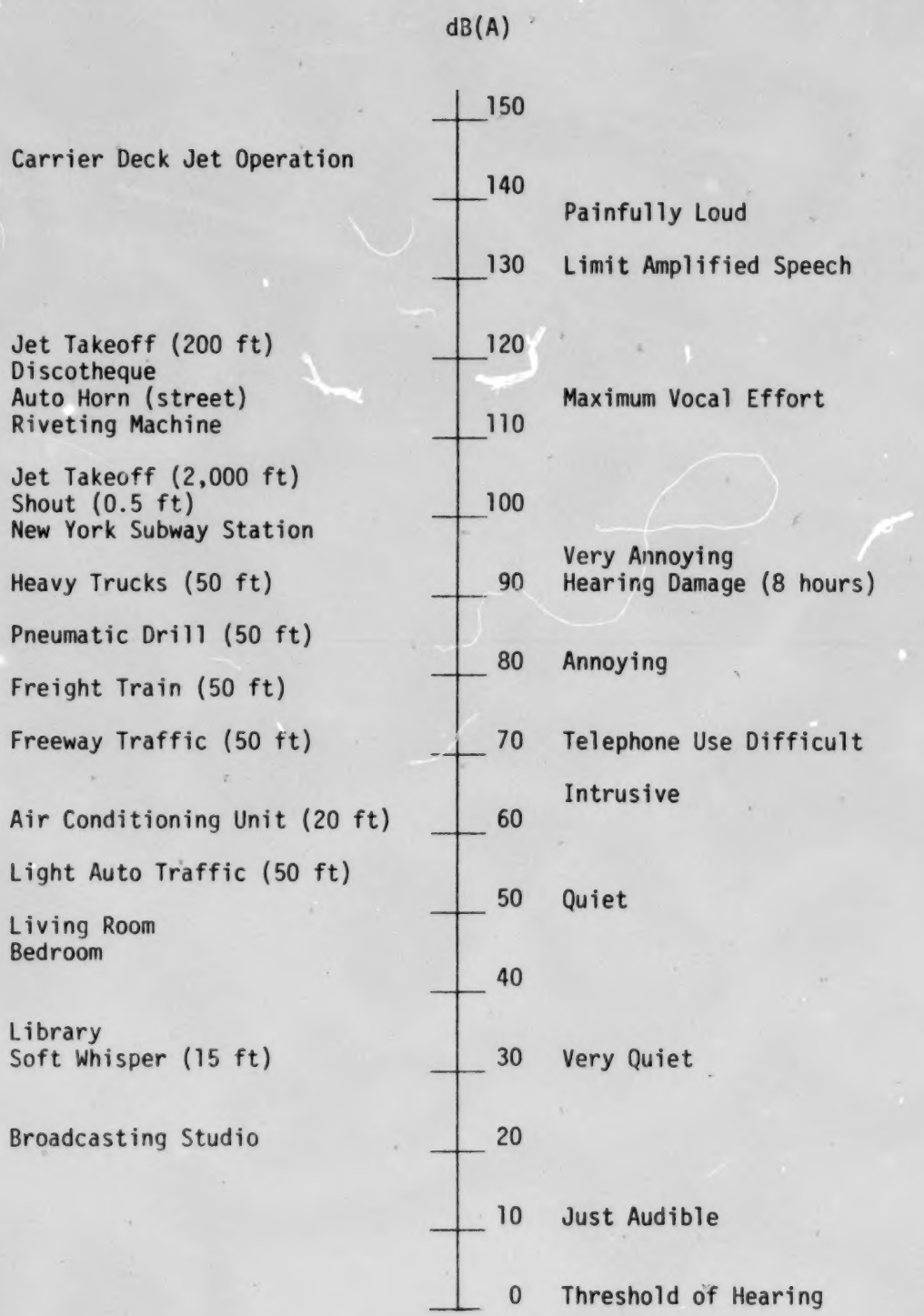
Ask a gas station mechanic how a muffler works on a car.

Ask the custodian if acoustical tiles are used in the school and why.

ACTIVITY 37: (Continued)

NOISE POLLUTION

Sound Levels and Human Response



ACTIVITY 38:

Have students discuss newspaper or magazine articles on pesticides, mercury and other contaminants in food chains.

ACTIVITY 39:

Set up a debate between two groups. One group will represent proponents of pesticides; the other group will represent opponents. Be sure both groups have researched their stand.

ACTIVITY 40:

As a class, study biological controls, and companion planting. Discuss the possible uses of these controls along with the uses of pesticides. Try to determine what you think is best and let your understandings and views be known.

ACTIVITY 41:

Ask students to determine the extent of pesticide use in the home. Survey the home for products with pesticide or biocide ingredients. Research the products most common to the home to determine their safety.

ACTIVITY 42:

Have students read the booklet, Pesticides, produced by the National Wildlife Federation. Discuss the material and use the activities for class stimulus.

ACTIVITY 43:

Invite a farmer, an organic gardner, an ecologist and a pest control representative to visit the class and give a panel discussion on pesticides. Have specific questions ready for your panelists. A moderator, probably the teacher, should take on this responsibility: be sure you inform your panelists of the situation in which they will participate. If you cannot get your panelists to participate together, urge them to speak to the class as individuals. You may have to be careful with this one!

ACTIVITY 44:

As a class, decide on a project to inform the community about pesticides. You may want to write a series of articles to your local newspaper about the perils of pesticides. You may want to produce a pamphlet about the various pest control measures. Some categories might be: hard pesticides, soft or acceptable pesticides, and biological and alternative controls. Students will need to research and contact local officials from the Department of Agriculture, the Health Department and the Forest and Park Services.

ACTIVITY 45:

1) Can compounds be broken into elements?

2) What implication does this have on the environment?

The student should do one of the following three experiments to find and prove the answer to this problem.

a) $C_6H_{12}O_6 + H_2SO_4 \rightarrow C + H_2O$ Refer to: ISCS Ch. 12, pg.177

H_2O + electricity $\rightarrow$ H + O Refer to: The World of Living Things Pg. 9

b) PbI_2 + heat $\rightarrow$ Pb + I_2 Refer to: ISCS Ch. 6, pg. 81
(Yellow Solid) (Shiny Solid) (Purple Gas)

c) HgO_3 + heat $\rightarrow$ Hg + O_2

After the students do one of the previous experiments warn them that they shouldn't mix chemicals at home. For example:

Bleach + Ammonia $\rightarrow$ Cl
Comet + Ammonia $\rightarrow$ Cl

Both of these reactions give off chlorine gas which can kill you when inhaled.

Explain to the students why a satellite was sent up to study the ozone layer. FIC + $O_3 \rightarrow O_2$ + O

After proving compounds do break down into elements, have the students look up iodine, mercury and chlorine. Have them keep a chart listing these elements and their affects on man and his environment.

I = death if breathed

Cl = death if breathed

Hg = deformation, brain damage in fetuses, infants ; brain damage and death in adults

O_3 = Ultraviolet light will get to the earth and "toast" us

ACTIVITY 46:

1) Can atoms rearrange and make new compounds?

2) What implication does this have on the environment?

Have the students do the following experiment: $PbNO_3$ + KI $\rightarrow$ PbI_2

Lead nitrate is a white crystal; when mixed with water it is a clear liquid. Potassium iodide is a white crystal; when mixed with water it is a clear liquid. Lead iodide is a yellow solid. There will be left overs which will be clear.

ACTIVITY 46: (Continued)

You can test the yellow solid to prove that the lead and the iodide changed partners. (You will find this experiment in ISCS Vol. 2, Ch 6)

Discuss the effects of PAN.

Nitrogen Oxide + Hydrocarbons $\xrightarrow{\text{sunlight}}$ Peroxyacetyl Nitrate + Ozone

PAN causes: eye watering, respiratory distress, and stops photosynthesis (plants starve).

Discuss the effects of H_2SO_4 .

SO_2 + dust or fly ash + H_2O (wet lungs or tissue)$\rightarrow H_2SO_4$ (sulfuric acid)

Sulfuric acid is a health hazard because it destroys lungs and it corrodes metal and limestone.

Discuss the effects of hydrocarbons (things made from coal, oil, and natural gas, etc.). The aromatics (alcohol, ethers, and paint thinners) cause cancer. Warn your students to have adequate ventilation when working with these materials. Warn them not to inhale any aerosols. Also warn them to read the labels of chemicals and follow the directions.

ACTIVITY 47:

In order to demonstrate that air pollutants, like SO_2 , can be detected and identified, have the student do this experiment.

Air pollution has already become a serious problem and is getting worse with each passing year. Sometimes there is so much sulfur dioxide in the air, especially in cities, that you can smell its sharp, stinging odor.

If you burn a bit of sulfur and carefully sniff the gas that is given off, you will smell the distinctive odor of sulfur dioxide. Although a chemist may use his nose to help him identify a chemical, he usually relies on chemical analysis which is a more accurate method of testing. Some of these chemical analysis methods depend on color changes. Project I describes one way to identify sulfur dioxide (SO_2) by observing the color change it produces in a potassium permanganate ($KMnO_4$) solution. A solution of potassium permanganate is purple. It becomes almost colorless when sulfur dioxide is added. This happens because potassium permanganate combines with sulfur dioxide forming manganous sulfate ($MnSO_4$), which is so light pink that it is almost colorless. Potassium sulfate (K_2SO_4) and sulfuric acid (H_2SO_4) are also produced in this reaction, as shown in the following equation:

$$2KMnO_4 + 5SO_2 + 2H_2O \longrightarrow K_2SO_4 + 2MnSO_4 + 2H_2SO_4$$

This reaction will take place only if the potassium permanganate solution is slightly acid. For that reason, a drop of dilute hydrochloric acid (HCl) is added. The hydrochloric acid does not take part in the reaction.

ACTIVITY 47: (Continued)

Scientists keep a careful and constant check on the percentage of sulfur dioxide in the air. This helps them to find out if their efforts to control air pollution are producing good results. It is not enough to be able to detect the presence of sulfur dioxide. It is also necessary to be able to measure the amount of sulfur dioxide in the air.

Project I: How to Identify Sulfur Dioxide

You will need: powdered sulfur (S), potassium permanganate ($KMnO_4$), a sensitive balance with masses, weighing paper, a 100-ml graduated cylinder, a 1-ml pipette, a 250-ml Florence flask, a 250-ml beaker, a stirring rod, a 2-hole rubber stopper to fit the flask, a 1-foot piece of glass tubing to fit the holes in the stopper, one foot of rubber tubing into which the glass tubing fits, a bunsen burner, 2 tubing clamps, a tripod, wire gauze, asbestos pad, triangular tile, two 6-inch test tubes and test tube rack, distilled water, barium chloride, dilute hydrochloric acid, litmus paper, two bottles with stoppers, labels and a pen.

1) Make a 0.99% solution of potassium permanganate as follows: (a) Place weighing paper on the balance and measure 0.99 gm of potassium permanganate, then pour into the 250 ml beaker.

   (b) Pour 50 ml of distilled water into the beaker and stir with stirring rod until the potassium permanganate dissolves.

   (c) Pour the resulting approximately 50 ml of potassium permanganate solution into the 100 ml graduated cylinder. Add distilled water until the total volume of solution in the cylinder is 100 ml. Note the purple color of this solution.

   (d) Pour the solution from the cylinder into the bottle. Stopper the bottle tightly and label it "Potassium permanganate solution, 0.99%." The 0.99% means that there is 0.99 gm of potassium permanganate in 100 ml of solution. Set aside for use in Step 5

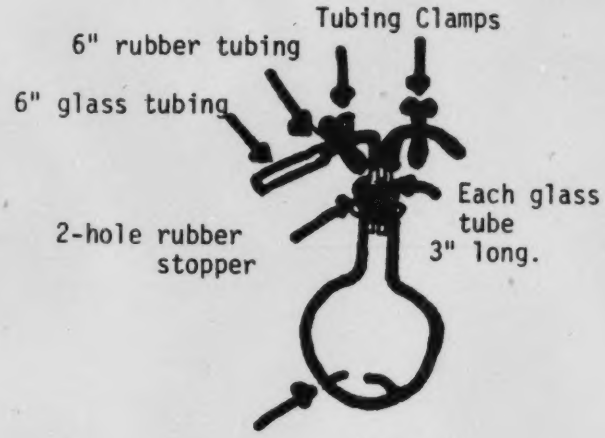


Fig. 1. Set-up for Making Sulfur Dioxide

ACTIVITY 47: (Continued)

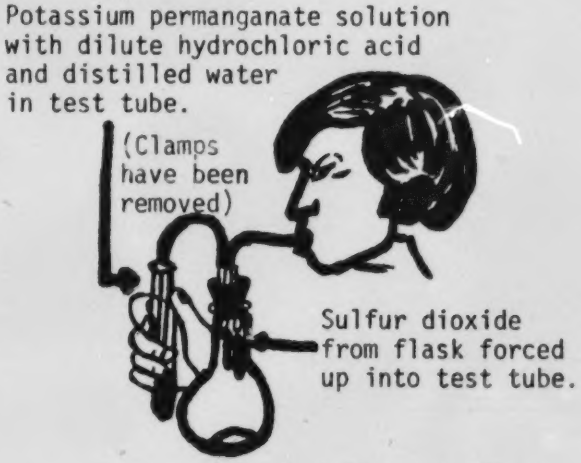
Note: Only a small amount of $KMnO_4$ solution (100 ml) should be made at one time because it can be spoiled by chemicals in the air, which react with it. That is why the solution must be kept in a tightly stoppered bottle.

2) Dissolve 0.1 gm of barium chloride in 100 ml of distilled water. Pour the solution into a bottle. Stopper the bottle and label it "Barium chloride solution dilute." Set aside for use in Step 6.

3) Prepare a set-up as in Fig. 1. See Steps 1-5, Project 1, for this procedure. Then, slip on a clamp over each rubber tube.

4) Unstopper the flask in the set-up. Pour 0.1 gm of powdered sulfur into the flask. Stopper the flask and close the rubber tubes with the clamps (see Fig. 1). Place set-up on the tripod and heat the flask over the bunsen burner (see Fig. 2) until the sulfur burns. When the burning stops, shut off the bunsen burner flame. The air in the flask now contains sulfur dioxide. Let the flask cool, then remove set-up from tripod.

Fig. 2. Making Sulfur Dioxide


Potassium permanganate solution with dilute hydrochloric acid and distilled water in test tube.
(Clamps have been removed)
Sulfur dioxide from flask forced up into test tube.
Fig. 3. Forcing Sulfur Dioxide Into Test Tube.

5) Pour 10 ml of distilled water into one of the 2 test tubes in the test tube rack. Then, with pipette, add a drop of 0.99% potassium permanganate solution and a drop of dilute hydrochloric acid to the distilled water in the test tube. Remove clamps on the set-up. Put the glass tube from the set-up into the test tube so that its end is near the bottom of the test tube (see Fig. 3). Blow through the rubber tube, forcing sulfur dioxide from the flask through the potassium permanganate solution in the test tube (see Fig. 3). Be sure to blow out the SO_2 -- do not breathe in. The sulfur dioxide will make the purple potassium permanganate solution colorless. Discard contents of the test tube.

Note: The decolorization of $KMnO_4$ is often used to identify sulfur dioxide. However, other chemicals such as hydrogen peroxide can also decolorize potassium permanganate. That is why the barium

ACTIVITY 47: (Continued)

chloride test, described in Step 6. is needed to make the identification of sulfur dioxide positive.

6) Pour 10 ml of dilute barium chloride solution into another test tube. Blow sulfur dioxide from the flask through the solution as in Step 5. The white precipitate that forms in the test tube is barium sulfite. Now drop a piece of blue litmus paper into the test tube. With the 1 ml pipette add dilute hydrochloric acid to the test tube until the solution is acidic enough to turn the blue litmus paper red. The hydrochloric acid dissolves the white barium sulfite precipitate, leaving the solution clear. This shows that the precipitate cannot be barium sulfate, which would not be dissolved by hydrochloric acid. Discard test tube contents.

Note: While other chemicals form precipitates with barium chloride solution, they do not also decolorize potassium permanganate solution. That is why a gas which can decolorize potassium permanganate and also form a precipitate with barium chloride, can be identified positively as sulfur dioxide. (SO_2).

ACTIVITY 48:

1) Can elements mix and create compounds?

2) What implication does this have on the environment?

The student should take the hydrogen and oxygen made in Activity 45 (or made by the electrolysis of water) and mix them.

$$H + O \longrightarrow H_2O$$

Discuss the effects of mixing N + O.

N+ O+ high temperature and pressure (like in cylinders of internal combustion engines and electric power plants) $\longrightarrow$ NO

NO is a colorless, odorless, tasteless gas that is relatively harmless. But -

$$NO + O \longrightarrow NO_2 \text{ and } NO_2 + HC + O_3 \xrightarrow{\text{light}}$$

hundreds of harmful compounds.

Discuss the affects of burning sulfur.

$$S + \text{fire} \longrightarrow SO_2 \text{ or } SO_3 \text{ or } H_2SO_4$$

These products are corrosive, irritating and help cause respiratory diseases. (26,260 people died last year in America due to bronchitis, emphysema, asthma).

Discuss the effects of CO. Burning organic matter + O $\longrightarrow$ CO$\uparrow$

Warn students about working on a car in a closed place, cooking on a grill in a closed place, or staying in a car being heated for an extended period of time without ventilation. CO as low as 100 parts per million

ACTIVITY 48:

can cause dizziness, headache, fatigue, and slow driving responses. In heavy traffic jams, concentrations almost four times this have been measured. The nonsmoking city man gets as much CO as a smoking country man (1 pkg. per day).

Discuss the effects of herbicides on people. They cause skin change, arsenic buildup in soil, and kill forests and mangroves that people rely on.

ACTIVITY 49:

Have the students watch the film "A Breath of Air" from the American Cancer Society. Have the students watch the film "From One Cell" from the American Cancer Society. Give out pamphlets on smoking, etc. from the American Cancer Society and discuss ways to prevent cancer.

Have the students see how much air their lungs will hold.

You will need: two 1 gallon glass jugs, a 2-hole rubber stopper to fit the opening of one of the jugs, 2 pieces of glass tubing to fit the holes in the stopper (one piece about 3" long, the other long enough to reach from 1" above the top of the stopper to the bottom of the jug), 2 pieces of rubber tubing (each 1" long) a graduated cylinder (100 ml or larger), a bunsen burner, a cloth towel or 2 pot holders, liquid detergent, an asbestos pad and a triangular file.

1) To cut the 2 pieces of glass tubing to proper length draw an edge of the triangular file firmly across glass tube at place where you wish to cut it (Fig. A).

2) Protect both your hands with the towel or pot holders. Hold the score mark on the tube away from you. Press with both protected thumbs opposite the score mark, then push the tube away from you (see Fig. B). The tube will break at the score mark.

3) Fire polish the rough ends of each tube by holding the rough end of the glass tube in the hottest part of the bunsen burner's flame, just above the flame's inner blue cone (see Fig. C). Rotate tube in flame until its rough edges are rounded. Then put the tube on the asbestos pad until glass is cool.

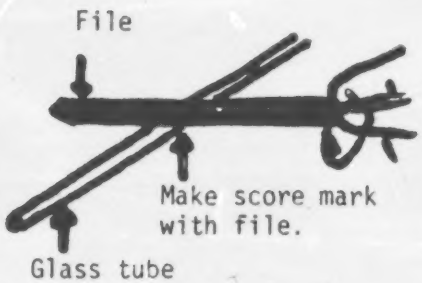


Fig.A. How to Cut Glass Tubing.

Fig. B. How To Break Glass Tubing at Score Mark

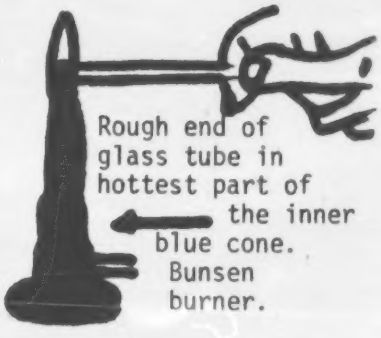


Fig. C . How to Fire Polish Glass Tubing

ACTIVITY 49: (Continued)

4) Moisten one end of each glass tube with liquid detergent. Protecting hands with the pot holders or towel, gently insert moist ends of glass tubes into the rubber stopper with a twisting motion as shown in Fig. D, and complete as in Fig. E.

5) Moisten one end of each rubber tube with liquid detergent. Slip a rubber tube onto the upper part of each glass tube.

6) Completely fill a gallon jug with water. Insert the rubber stopper with the tubes into the opening of this jug (see Fig. F).

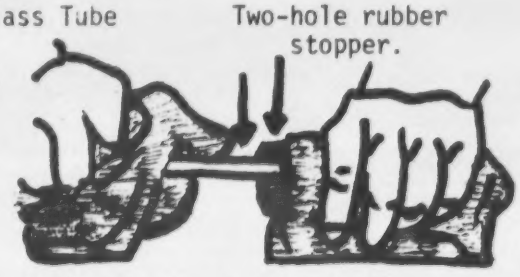


Fig. D. How to Insert Glass Tubing Into Rubber Stopper.

7) Into the second jug, put the free end of the rubber tube which is attached to the longer glass tube. Now you are ready to test your vital capacity.

8) Take a deep breath, hold your nose with one hand and blow into the rubber tube connected to the shorter glass tube until you are out of breath. As you do so, water pours from the other rubber tube into the second glass jug (see Fig. F).

9) To measure the volume of air exhaled in one breath, pour the water from the second jug into the graduated cylinder as shown in Fig. G. If your vital capacity is large, the graduate may have to be filled several times to measure the total volume of water in the jug. If so, don't pour water into the graduate past its 100 ml top line. Read and record the volume in the cylinder each time you fill it. Then add all the recorded volumes to get the total volume. The amount of air that you can exhale with one breath is your "vital capacity." This amount of air is equal to the amount of water you forced from the first jug into the second jug.

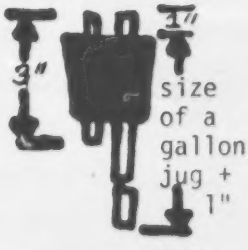


Fig. E. Hidden View of Glass Tubing in Rubber Stopper.

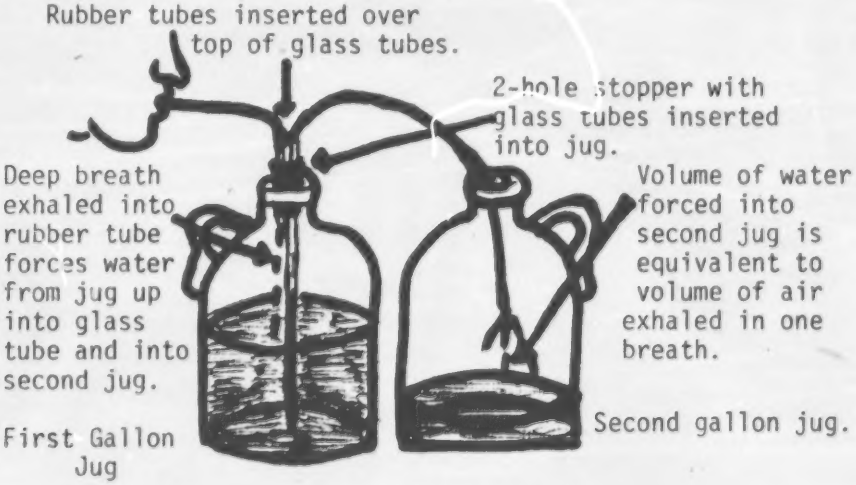

Rubber tubes inserted over top of glass tubes.
2-hole stopper with glass tubes inserted into jug.
Deep breath exhaled into rubber tube forces water from jug up into glass tube and into second jug.
Volume of water forced into second jug is equivalent to volume of air exhaled in one breath.
First Gallon Jug
Second gallon jug.

Fig. F. Set-up to Test Vital Capacity

ACTIVITY 49: (Continued)

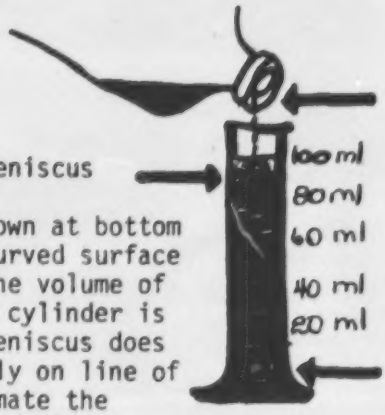

Water poured from jug into graduated cylinder.
Meniscus
100 ml
80 ml
60 ml
40 ml
20 ml
Read volume shown at bottom of meniscus (curved surface of liquid). The volume of liquid in this cylinder is 92.4 ml. If meniscus does not fall exactly on line of graduate, estimate the fraction of the volume.
100-ml graduated cylinder.

Fig. G. How to Read Volume in Graduated Cylinder

ACTIVITY 50:

You will need: the equipment used in Project I, graph paper, a pencil and a pen.

1) As in Steps 8-9, Project 1, measure the vital capacities of people of different ages in your community or your family.

2) Record each person's name and sex, age, height and vital capacity as in Table 1.

3) Make graphs using the information you have gathered.

Table 1. HOW AGE AFFECTS VITAL CAPACITY

NAME	SEX	AGE IN YRS	HEIGHT IN INCHES	VITAL CAPACITY IN MILLILITERS
Susan Cipolla	F	11	54	148
Stuart Langer	M	36	67	735
John Costas	M	17	71	920
May Lindley	F	62	61	176

One graph might show how vital capacity is related to the age of the people (see Fig A). Because older poeple have been breathing polluted

ACTIVITY 50: (Continued)

for a longer time than young people, your graph might show the affect of air pollution on the vital capacity of the older people. Another graph might show the affect, if any, height has on vital capacity (see Fig. B).

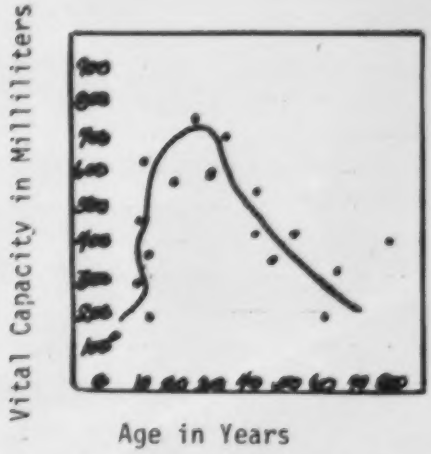


Fig.A. Graph Shows How Vital Capacity in Related to Age.

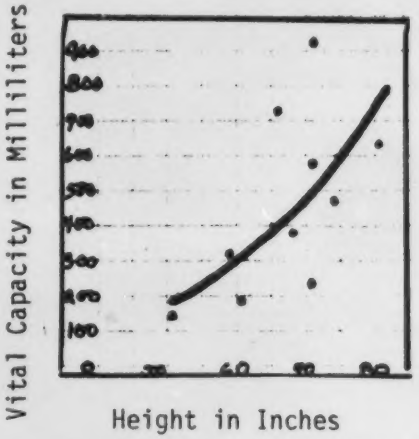


Fig. B. Graph Showing How Height Affects Vital Capacity.

Is there any difference in the vital capacity of people of the same age, living in different kinds of localities? If we can find the answers to this essential question, it can be important to us when we decide what kind of locality is least dangerous to our health.

ACTIVITY 51:

Have the student measure the maximum pressure of a person's breath. Compare the results with the graph.

You will need: a 500 ml flask, a 2-hole rubber stopper to fit the flask, a 3' long piece of glass tubing to fit the holes in the stopper, 6' of clear plastic tubing that can fit tightly onto the glass tubing, a ringstand, some food coloring or other non-poisonous dye, cellophane tape and yardstick. Set up the apparatus shown in Fig. A.

1) Cut pieces of glass tubing (one piece about 3" long and the other long enough to reach from 1" above the top of the stopper to the bottom of the glask).

2) Fire-polish the ends of the glass tubes.

3) Insert the glass tubes into the rubber stopper.

ACTIVITY 51: (Continued)

4) Cut a 12" piece of plastic tubing, moisten one end and fit it onto the 3" piece of glass tubing on the rubber stopper. Then cut a 36" piece of plastic tubing, moisten one end and fit it onto the longer glass tube.

5) Pour water into the 500 ml flask until it is about half-full.

6) Add enough dye to color the water in the flask to make it easy for you to see the water when it rises inside the plastic tube.

7) Fit the rubber stopper with its tubes into the flask as in Fig. A, and place it on the ring stand.

8) Tape the yardstick to the ring stand so that bottom of the yardstick is perfectly aligned with the top of the water in the flask (see Fig. A).

9) Tape the longer plastic tube to yardstick as shown in Fig. A.

10) Ask a person to take a deep breath and blow into the short plastic tube, measure on the yardstick the greatest height the water reaches in the long vertical plastic tube (see Fig. A).

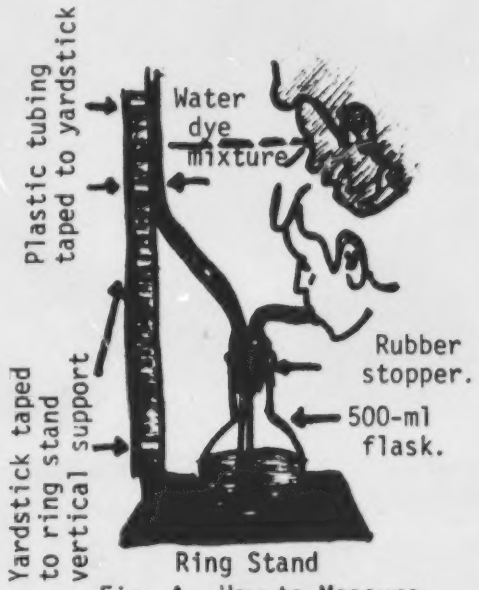


Fig. A. How to Measure Maximum Breath Pressure.

Explanation: Each foot that the water rises in the tube represents 0.433 pounds per square inch of pressure. Table 1 enables us to convert inches of water to pressure in pounds per square inch. With this information we can proceed to make a variety of important studies of how pollution affects our lung power. For example, how does a person's age affect his maximum breath pressure?

Table 1. How to Convert Inches-of-Water to Pressure-in-Pounds per Square Inch.

Height of Water in Inches	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Pressure in Pounds per Square inch	0.036	0.072	0.108	0.144	0.180	0.216	0.252	0.288	0.324	0.360	0.432	0.468	0.504	0.540	0.576	0.612	0.648	0.684	0.720	

ACTIVITY 51: (Continued)

11) Measure the maximum breath pressure of people of different ages in your community.

12) Record each person's age and maximum breath pressure.

13) Make a graph showing the relationship of maximum breath pressure to age (see Fig. B).

14) Study your graph. Does your graph indicate a difference in the breath pressure of the various age groups?

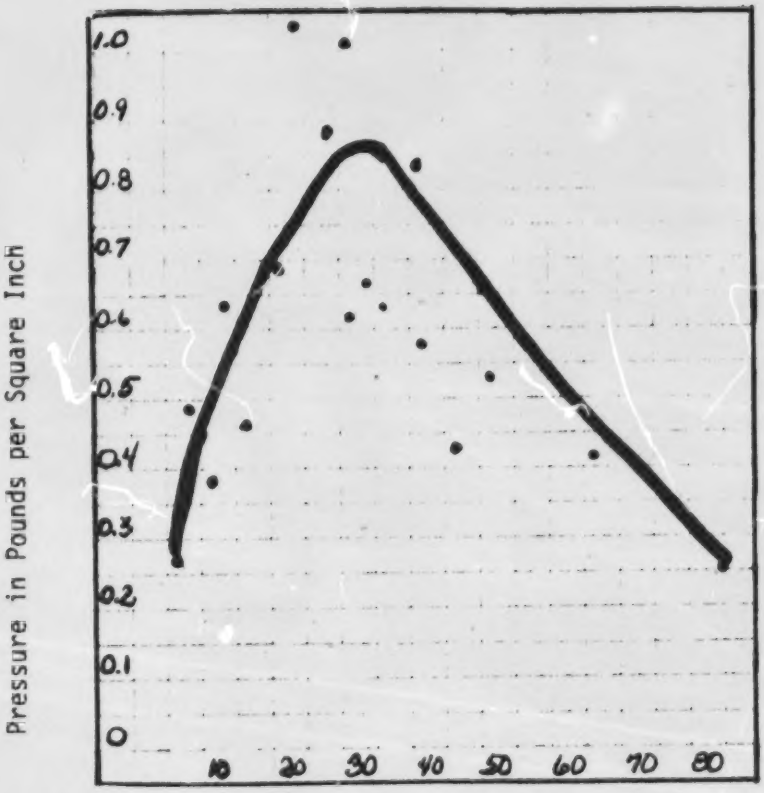


Fig. B. Graph Showing Relationship of Maximum Breath Pressure to Age.

ACTIVITY 52:

1) Can elements or compounds mix and create heat?

2) What implications does this have on the environment?

Have the students do the following experiment (ISCS, Ch. 8)
$(CuSO_4 + H_2O) + Zn \longrightarrow$ (high temperature change) Δ°C

Have students fill out this questionnaire. Pretend it is a survey from a major chemical company. They are trying to get permission to move into the neighborhood.

1) Do you have any objections to our chemical plant moving into the neighborhood.

2) Would you consider coming to work for us?

3) Would it be all right if we share your river?

4) Would you like it if we raise the temperature of the river a few degrees so you can swim in the winter?

5) Wouldn't you like to increase the number of consumers in your area? Our plant will need 100 workers. Some of these will transfer into your community. That will mean more business for your stores. Isn't that great?

Your students may want to use this information in making their decision.

1) Increased temperature increases the fishes need for oxygen.

2) Increased temperature affects growth, digestion and appetite of fish.

3) Heat causes compounds to break into elements.

4) Heat causes elements to form compounds.

5) Many rivers have been banned to swimmers because of bacteria which have reproduced because of temperature changes.

6) Many fish lay their eggs in the wrong season because of unnaturally heated waters. Once laid the fish eggs may not develop because of extreme temperatures.

7) The Fish Commission has declared that a rise of 5.4°F in the Columbia River could be disastrous for the eggs of the Chinook Salmon.

8) It has been determined that "the highest temperatures that most fishes of North America can tolerate range from about 77 to 97 degrees F." Because water temperatures in some rivers are approaching or exceeding these limits, state and federal water pollution agencies have begun to watch water temperatures closely.

OBJECTIVE:

To recognize that the physical, mental, emotional and social aspects of human growth and development are interrelated.

ACTIVITY 1:

In order to begin to develop an understanding of ways that the physical, mental, emotional and social aspects of human growth and development are interrelated, the students should develop an understanding and an awareness of the way they feel and think, the way their peers feel and think, and the way people of different age groups feel and think.

Give the students an attitude questionnaire at the beginning and at the end of the year. Compare questionnaires.

WHAT'S OUR WORLD LIKE

PREFACE

"What's Our World Like?" is a checklist of statements to which each student responds in agreement, disagreement or no opinion. It should be given when there is plenty of time for discussion afterwards. Students should be assured they will not be graded and that their papers should not have their names on them.

This Survey is written in human terms and is intentionally open to interpretation and--most important--to discussion. Its purpose is not scientific validity. After all, the important thing is not just "what" a person believes, but why he believes it, how he arrives at his conclusions.

This tool will help identify awareness levels of environmental concerns. It in no way labels any values as "right" or "wrong", but simply points out areas for further teaching activities.

The goal is not to end up with individual scores as compared to a fixed set of answers. You conclude instead with a group awareness of values toward environmental concerns. Each individual knows how he fits into that group and may or may not make his position public. These values are then discussed in terms of "why"--information, misinformation, motivation, model behavior, etc.

The items on the checklist are scrambled and deal with eight different environmental concerns:

aesthetic appreciation of the natural world	1, 15, 16, 21, 26, 31, 35, 50
air pollution	-10, 11, 24, 40, 46
litter	- 5, 6, 19, 30, 37, 47
population	- 7, 18, 38, 44, 49
resource use	- 2, 3, 27, 32, 42
transportation	- 8, 9, 14, 20, 22, 39
vandalism	- 4, 17, 28, 36, 43, 48
water pollution	-12, 13, 23, 25, 41, 45

We all live in a similar world--to find out some of the differences of perception of that world, some of the values toward it, administer this survey and initiate its discussion. Then write (or chart or draw) the results and what plans you have for environmental education activities related to them.

WHAT'S OUR WORLD LIKE

DIRECTIONS: DO NOT PUT YOUR NAME ON THIS. Just read it and say what you really think. Check A if you agree with it, D if you disagree with it, and N.O. if you have no opinion one way or the other.

AGREE	NO OPINION	DISAGREE	
___	___	___	1. The beauty and serenity one experiences in natural areas, like mountains, forests, lakes, and beaches, is important.
___	___	___	2. The sea will give us our food for the future.
___	___	___	3. A person should be able to use any amount of gas, electricity, etc., he can afford.
___	___	___	4. Writing on the wall or desks is wrong.
___	___	___	5. Litter is a serious problem.
___	___	___	6. A cigarette butt tossed on the lawn is not litter.
___	___	___	7. There are too many people in the world now.
___	___	___	8. Not every person should be able to have a car of his own.
___	___	___	9. You would not use cars if you were provided with other means of transportation.
___	___	___	10. Anti-pollution devices on cars are necessary.
___	___	___	11. There is little one person can do to reduce air pollution.
___	___	___	12. There are chemicals in the water I drink.
___	___	___	13. If I saw a can in the water and I could get to it safely, I would remove it.
___	___	___	14. The recreational use of vehicles such as trail bikes, snowmobiles, and campers should be strongly regulated or discouraged.
___	___	___	15. Recreation and relaxation in the outdoors is more fun than relaxing by watching television.

AGREE	NO OPINION	DISAGREE	
___	___	___	16. I would rather walk along a road in a natural area than ride in a car through the area.
___	___	___	17. Vandalism is a problem at my school.
___	___	___	18. More people means more pollution
___	___	___	20. Building more roads would provide better transportation.
___	___	___	21. I spend more time in outdoor recreation than in indoor recreation.
___	___	___	22. Other means of transportation are better for the environment than cars.
___	___	___	23. I have never contributed to water pollution.
___	___	___	24. My health can be affected by air pollution.
___	___	___	25. I conserve water whenever I can.
___	___	___	26. Trees, shrubs, and plants used with a building do not add beauty.
___	___	___	27. Plants and animals are here only for man's use.
___	___	___	28. I would not report fellow students for damaging school property.
___	___	___	29. A gum wrapper thrown to the ground is litter.
___	___	___	30. Litter is not a serious problem in my neighborhood.
___	___	___	31. All parks should have air-conditioned eating places.
___	___	___	32. We need gas and electricity even if it causes some harm to other things.
___	___	___	33. Choices will have to be made between preserving natural wilderness areas and developing their natural resources.
___	___	___	34. Pesticides for killing bugs that eat our food crops are necessary.
___	___	___	35. I enjoy being alone in a natural area.

AGREE	NO OPINION	DISAGREE	
___	___	___	36. My school is a nice, comfortable place to be.
___	___	___	37. A person throwing paper or a can from an auto should be prosecuted by the law.
___	___	___	38. There will not be too many people in the world in the future.
___	___	___	39. Cars are better for individual people than other means of transportation.
___	___	___	40. Industry causes more air pollution than automobiles.
___	___	___	41. It is possible for everyone to use less water.
___	___	___	42. Science will solve our environmental problems.
___	___	___	43. I would help to make our school nicer.
___	___	___	44. People should be able to have as many children as they want.
___	___	___	45. No one should be allowed to have a swimming pool.
___	___	___	46. Increasing gas mileage is more important than increasing pollution caused by cars.
___	___	___	47. Litter is not a serious problem in my school.
___	___	___	48. I treat my school the same way as I do my own property.
___	___	___	49. We can solve the crowding problem on our planet by migrating to other planets.
___	___	___	50. We should kill for food and protection rather than for sport.

ACTIVITY 2:

Have students take the questionnaire home to an adult. Encourage them to share the results of the adult questionnaire with theirs. See if they can tell why there may be a difference in opinion. Ask them if they think they will change their attitude and opinions as they grow older.

ACTIVITY 3:

To introduce the idea of increasing populations of man in the world, show the film, "World Population", available through Learning Resources Center.

ACTIVITY 4:

Have the students make a list of the peers that tease them about recycling. Then have them go back and try to think like those persons and see if they can figure out why these students feel the need to harass them. After they understand more about the other persons, see if they can come up with something that could help them to see the need for recycling, help them find some friends, get some positive attention or whatever they may need.

ACTIVITY 5:

Ask the students environmental questions out of a values clarification book daily or weekly. They can keep a journal of their reactions or spend a few minutes on the "Question for the Day" at the end of the period.

ACTIVITY 6:

To stimulate social growth, show the film, "Vandalism, Why?". Discuss the three reasons why people vandalize:

1) People go through a destructive stage as children and never grow out of it.

2) People are taught by others and want to be part of the crowd.

3) People destroy things because they never learned how to create for themselves.

Film is available through Learning Resources Center.

ACTIVITY 7:

In order to demonstrate how each person's attitude and behavior has an effect on the total population, show the film, "Tragedy of the Commons", which is available through Learning Resources Center.

ACTIVITY 7: (Continued)

Tell the story about how the neighborhood is going to have a party. Each person was asked to bring a pitcher of wine and pour it into a keg. Each figured that they could pour a pitcher of water into the keg without making a difference. The day of the party they opened the keg and there was nothing but water.

Discuss what things they consider to be "common" to all people; such as parks, roads, air, water, etc. What is the responsibility of each individual in caring for the commons?

ACTIVITY 8:

Show the film "Population and the American Future". Have the students identify with one person in the film and explain that person's viewpoint at the end of the film. To aid discussion, it is important when letting students express themselves, that you respect their opinion even if it differs with your own or others. When the students see your attitude, hopefully, they will assume the same attitude of respect and they will feel more open to discuss their feelings. If the mood is set before a discussion, the discussion itself will run much better.

1) Tell the students to identify with the other students. Each student feels he is important and wants the others to listen to what he has to say.

2) Tell them to expect someone else in the class to differ in opinion and to realize they would like a chance to express themselves or to talk to someone who differs from them.

3) Explain that they should not necessarily try to change the others' opinions, but rather state how they feel.

Film is available through Learning Resources Center; also "Zero Population Growth" at the University of Florida.

ACTIVITY 9:

Show the film "The Hunter" and discuss why people kill. Ask students if they think they should kill for sport or for food and protection. Ask them if they think there should be game reserves, laws, etc.

Film is available through Learning Resources Center.

ACTIVITY 10:

Have the students bring in records on pollution, crime rate, junk foods, the balance of nature, the food chain, country life vs. city life, etc. Play the records (be sure to preview) and have them discuss or write a paper on why they think these people are singing about these problems.

ACTIVITY 10: (Continued)

For example:

The Moody Blues	"Question the Balance"
Bob Dylan	"Junk Food Junkie"
Cat Stevens	"Where Do the Children Play"
Elton John	"Yellow Brick Road", "Honky Cat" and "Think I'm Gonna Kill Myself"
Three Dog Night	"Out in the Country"
The Moody Blues	"How Is It (We Are Here)"
Woodie Guthrie	"This Land Is Your Land"

ACTIVITY 11:

Choose an area around the school that is a popular "hang out" (high traffic flow) to improve. Let students clean it up, raise some cash and decorate it. Before you do it, ask them some questions:

1) Do you think the other students will appreciate it?

2) Do you think they will take care not to ruin it?

3) What can you do to ensure its protection (educate, signs, etc.)?

) What can you do if the students walk through it or pull up the flowers?

ACTIVITY 12:

Keeping in mind that the population of this country has increased approximately 20% over the last ten years, ask the students to complete this chart by determining the percentage of increase.

INDEX OF CRIME
1960-1970
per 100,000 population

OFFENSE	1960	1962	1964	1966	1968	1970	% INCREASE
murder	5	4	5	6	7	8	
robbery	60	59	68	80	131	172	
burglary	500	526	624	708	915	1068	
larceny	282	308	384	457	636	859	

Upon completing the computations have students list as many reasons as possible for this disproportionate increase:

ACTIVITY 12: (Continued)

1) How many of these reasons could be related to the often heard phrase "population explosion"? (Sociologists indicate that increased crowding results in increased crime rates.)

2) Does it appear that populations do have comfort zones? (Many feel that as a population grows above 40-100,000 in a city, that all orders such as crime begin to grow at an alarming rate.)

3) What happens when populations go above governmental capabilities? (Higher taxes and more bureaucracy.)

4) What happens when populations are very small? Do they support governments? (Yes, and at less cost to the public.)

5) Do you think rates will ever come down again?

6) How much of this increase in crime is relating to changing social values rather than density? (Comparing crime rates per 100,000 in a small city versus a large city such as Jacksonville could help answer the question. Large city crimes are significantly higher.)

7) Theorize as to the reasons for density-related crime. Compare the crime in single-family residential areas versus highrise apartments. What does the difference in crime rates have to do with territoriality?

ACTIVITY 13:

To realize that overcrowding in man leads to increased aggression (crime rate) draw the United States and Europe on large poster board paper (to scale). Locate at least 10 large cities with population of at least 1 million on both and mark them with bright red stars. Find the crime rate of each starred city and mark it next to the city in black. Now locate at least 10 smaller cities with population under 1 million and mark them with a blue dot. Find the crime rate of each blue dotted city and mark it next to the city in yellow. Make a list at the bottom of your posters.

1) Is there a large difference in the crime rates of cities where there is apparent overcrowding? If so, why?

2) Where would you expect the crime rate to be at its lowest? Highest?

3) Why is the crime rate higher in crowded areas?

4) How could you keep crime rates down without more policeman?

ACTIVITY 14:

Some people believe that there is only one way to avoid the hostile environmental effects of the human population explosion. They argue that the birth

ACTIVITY 14: (Continued)

rate must be decreased to match the death rate. To accomplish this, they insist that parents must take responsibility for keeping their families small.

Such suggestions are not well received by a large portion of the citizens of the United States. For example, over 40 percent of U. S. adults believe that an ideal family includes four or more children. Is that too large a number if the birth rate is to match the death rate? This activity will help you decide for yourself.

Suppose there are five sets of parents. In each set there are 12 adults (six couples). See Figure 1.

Set 1	Set 2	Set 3	Set 4	Set 5
6 men	6 men	6 men	6 men	6 men
6 women	6 women	6 women	6 women	6 women
12 adults	12 adults	12 adults	12 adults	12 adults

FIGURE 1

Suppose each set of couples has a different idea as to what is the best family size.

SET 1 prefers having one child per couple
SET 2 prefers having two children per couple
SET 3 prefers having three children per couple
SET 4 prefers having four children per couple
SET 5 prefers having five children per couple

Assume that the children, grandchildren, and so on of each parent-set agree with their parents. Using Table 1, calculate the size of the population that results from each parent-set for the next four generations. Assume that at the end of each generation, only the children of that generation are alive. Also, assume that each generation has, when possible, an equal number of men and women.

If you come up with an odd number of people in any generation, consider the unpaired individual to be childless.

ACTIVITY 14: (Continued)

NUMBER OF INDIVIDUALS
FOR GENERATIONS

Parent-Set	Parent	2nd	3rd	4th	5th
1	12				
2	12				
3	12				
4	12				
5	12				

TABLE 1

1) Which of the parent-sets will produce an increasing population?

_____

2) Which of the parent-sets will produce a population of steady size?

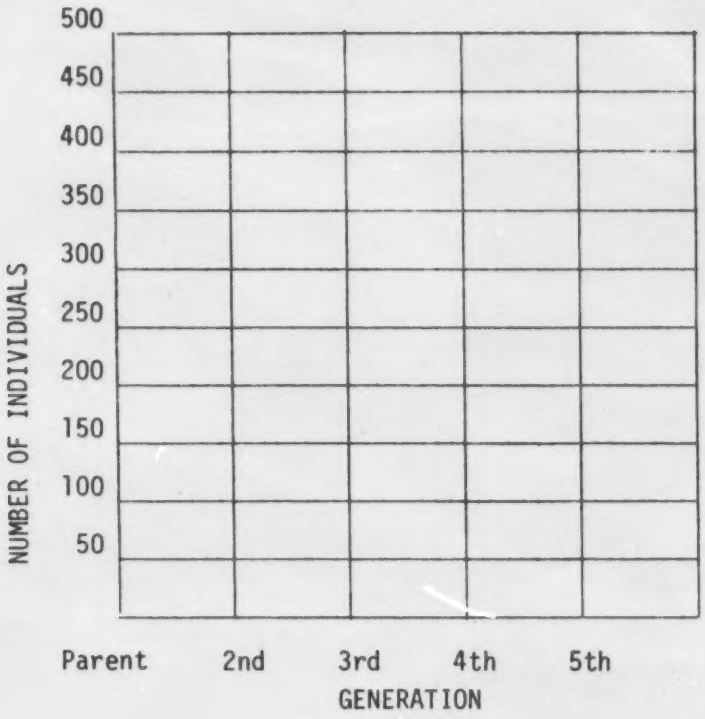
_____

3) Which of the parent-set populations will decrease in size?

_____

Graph the information in Table 1 in Figure 2. Draw a separate line or curve for each parent-set. Label each.

ACTIVITY 14: (Continued)



Studies of many different animals and plants have shown that the S-curve is characteristic of all their populations. There is first a slow, then a rapid increase in the population size. This is followed by a leveling off in the increase. Finally, the size of the population becomes relatively constant. Several variables seem responsible for these changes. The most important appear to be:

a) amount of food and needed gases;

b) the presence of wastes and poisons;

c) availability of space for the organism;

d) the presence of disease organisms

The environment cannot support more life than it can feed. Neither can it continue to support life if wastes and poisons become too concentrated. The greater the size of the population, the more the organisms are crowded together. Thus, accumulation of wastes increases.

Poor nutrition means a weakening of the living organism. Thus, chances of survival are reduced. Crowding and accumulation of wastes and poisons increase the likelihood of early death of the organism through spread of disease. Eventually, because of the input-output between environment and organisms,

NUMBER OF BIRTHS IN THE POPULATION = NUMBER OF DEATHS IN THE POPULATION

ACTIVITY 14: (Continued)

What then does all this mean for the human species? Man is an organism, and the population curves for organisms seem to have a similar shape.

4) What evidence do you have that the human population of the world is or is not increasing? _____

_____

5) If the world population is increasing, is the birth rate equal to the death rate? _____

_____

Look at Table 2. It contains approximate data for the world population from 1850 to the present. It also contains a prediction for the year 2000.

	YEAR								
	1800	1825	1850	1875	1900	1925	1950	1970	2000*
Total World Population (in billions)	0.9	1.0	1.2	1.4	1.7	2.0	2.7	3.5	6.5

TABLE 2 *Predicted on basis of current increase in rate.

6) Do the data in Table 3 indicate that the world population is continuing to increase? _____

When discussing variables (on previous page) you could set up this experiment to demonstrate the variables.

Put ¼ tsp. of yeast into a test tube with 10 ml of water and ¼ tsp. of sugar. Warm the test tube and its contents. Put a stopper on the test tube. Notice each day the increase in yeast and the activity (bubbles). Discuss why the bubbles eventually stop.

a) They ran out of oxygen

b) They ran out of food.

c) They were overcrowded.

d) They were poisoned by alcohol.

A bacteria culture will also do.

ACTIVITY 14: (Continued)

You can get a rough idea of how much of the S-curve is now completed for the human population. Use Figure 3 to graph the data from Table 2.

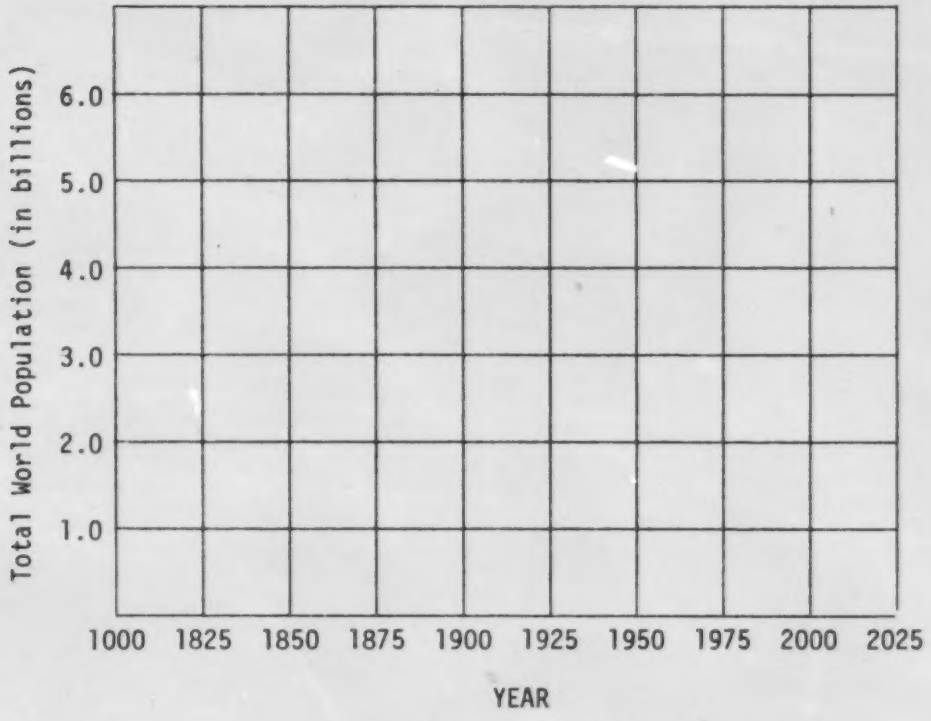


FIGURE 3

7) According to your graph, during which 25-year period has the world population increased the least? _____

The most? _____

8) Which of the curves in Figure 2 most resembles the world population curve you drew in Figure 3? _____

Suppose you agree with those who argue that the birth rate must not exceed the death rate.

9) Based on Table 1, what number of children would you recommend for each family? _____

10) What effects would unexpected increases in the world death rate have on this means of population control? _____

_____

ACTIVITY 14: (Continued)

11) What do you see as the strongest reasons for birth control?

_____

_____

_____

12) What do you think are the strongest reasons against birth control?

_____

_____

_____

ACTIVITY 15:

In order to help the students discuss how stress might lead to competition for the basics of existence, recreational facilities and educational facilities, have the students study this activity which shows aggressive behavior due to competition for limited space.

The demand for space for some animal species is an inherited behavior pattern which often causes space to become a limiting factor in any ecosystem (territoriality).

Probably one of the most immediate responsive shows of territoriality might be shown by holding a mirror to a Betta splendens (Siamese fighting fish available from aquarium shops) tank and observing the fish's reaction to the "outsider". Most students will be impressed with this behavior, but few will be able to relate this activity to humans without careful transfer leads from the teacher.

1) Why do the male Betta fish fight? (To guard a territory probably for breeding functions.)

2) Does this fighting benefit the species? (It probably serves to regulate the size of populations and thereby to keep the Bettas from overcrowding an environment.

3) Do people have territories?

4) How would you react if a stranger came over and stood 3" from you and faced you square on?

5) How would you react if someone came in off the street and decided to move your home?

6) Would you share your desk with someone from another school?

ACTIVITY 15: (Continued)

7) What if the Georgians began moving into North Florida and changing the laws?

8) What if the Chinese began moving into Russia?

9) What if the Martians did the same?

Terrirory is to be expressed at levels of:

Immediacy
Locality
Regionality
Continentally
Hemispherically
Etc.

10) What effect do you think this territorial feeling has upon animals when they are forced to become "refugees" for reasons such as:

Filling?
Draining?
Dredging?
Clearing?
Pollution?

Show "Cry of the Marsh", available through Learning Resource Center.

ACTIVITY 16:

Relate concept to man's territoriality in urban environments. Take the students downtown for a field trip. Point out for example:

a) how automobiles compete for parking spaces;
b) if congestion adds to aggression (people driving, people walking people talking);
c) how much of the natural environment is destroyed.

ACTIVITY 17:

Walk over to one of your students and begin to sit down in his or her lap. Draw the class attention to the student's reaction. Begin a discussion using the following question:

Why did this student react like he/she did. Did I invade his/her territory?

ACTIVITY 18:

See ACTIVITY 11 under the first objective.

ACTIVITY 19:

Man may induce enough changes in the environment until he is no longer able to survive.

Students are presented with two piles of chance cards. One pile represents cash values from 5¢ to one million dollars all of which (theoretically) could be kept by the student. The other pile contains environmental values which range from 5 bottle caps disappearing, to the saving of Lake Erie. Each student gets 3 chances to pick cards. After all the students have picked, tally the results to show how many money cards were picked as opposed to environmental cards. The purpose of this activity is not to predict a specific cause for environmental disaster, but rather to identify the "human nature" profile which will allow such a crisis to occur. It should be pointed out that greed is not a term used to define any Floridian, but rather it is a worldly term and should be kept in that scope.

1) Do you think man's monetary interests will make our environment unsuitable for human habitation? (Remember, that this doesn't need to be something super dramatic, but rather could be as simple as running out of water, polluting water beyond our ability to use it, losing our soil to erosion, air pollution such as that in Denora, Pennsylvania that killed several, or overpopulation relative to our food sources.

2) Is there any way that environmental losses can be computed in economic terms that will make industrialists and developers listen?

3) Remember, that environmental degradation can be localized and won't be a problem for all people. Do you think the greedy will sacrifice some of their monetary gains for the benefit of others? Are there any true cases of this in today's world?

ACTIVITY 20:

To make the student aware of the rising rate of suicide and its causes and prevention, as related to increased stress in overcrowded areas, ask them to listen to Elton John's "I Think I'm Gonna Kill Myself". Discuss reasons why people might want to kill themselves.

Be aware of suicide rates.

	Number of suicides per 100,000 in Florida	Number of suicides per 100,000 in Alachua County	Actual number of suicides in Alachua County
1973	16.5	27	33
1974	16.7	15	19
1975	17.7	12	15
1976			13 as of June 22

Have students make a graph using these figures.

ACTIVITY 20: (Continued)

Actual Number of Deaths by Suicide in the United States	
1930	18,323
1940	18,907
1950	17,145
1960	19,041
1970	23,480
1972	24,280
1974	26,430

Identify through discussion the major causes of suicide. These causes are:

a) the individual feeling isolated from society
b) the individual feeling he cannot change anything in the world

Read materials available from the Crisis Intervention Center.

Have a speaker from the Crisis Intervention Center talk with students about suicide among teenagers.

Have students discuss ways they can feel they are a part of society, through clubs, hobbies, friends, church, etc.

Have students list and discuss ways that they can help the class, school, community, etc., to change the world for the better, even on a small scale; for example, changing the school, the campus, the town, etc.

OBJECTIVE:

To determine ways man utilizes energy to explore and modify methods for more efficient energy utilization.

ACTIVITY 1:

In order to begin to distinguish between a luxury and a necessity as a step to understanding methods for more efficient energy utilization, the student should become aware of differences in the value of foods. Have the students keep a record of all the foods they eat for a week. Use the Current Science with "Check Your Food Habits" and have them total up the points of each food to see if they are getting what they need.

ACTIVITY 2:

Each day ask them which food is better for them, "A" or "B". Ask them at the end of the class. Have the "A" students go to one side of the room and the "B" students to the other side. This will force everyone to make a decision. Reward them by letting the correct side leave the room first. Some will choose because of their friends, but their friends won't always be correct.

For example:

Tomato Juice or Orange Juice*
Kool-Aid or HI-C*
White Rice or Brown Rice*
Apples or Watermelon*
Ice cream or milk*
Cap'n Crunch or Total*
Pear or Peach*
Butter or Catsup*
Walnuts or Almonds*
Steak or Turkey*
Bacon or Tuna*
Bologna or Salami*
Strawberries * or Tangerines
Canned Spinach or Frozen Spinach*
Lettuce or Turnip Greens*
Cabbage or Cauliflower*
Green Beans or Lima Beans*
Carrots* or Corn
Broccoli* or Brussel Sprouts

* Indicates the food that is nutritionally better
For more information, refer to "Check Your Food Habits."

ACTIVITY 1-2 REFERENCE:

What kinds of foods do you eat? Is your diet well-balanced? In the past most people rated their diets on the amount of calories they consumed. Calories are energy units. You need so many per day, these people thought.

But energy counts do not tell the entire story about the foods you eat. You also need to know if you're getting the right amount and kinds of protein, carbohydrates, fats, trace elements, and vitamins for proper health and growth. To assist you, Dr. Michael E. Jacobson of the Center for Science in the Public Interest has come up with a modern way to rate your diet. The method is "Nutrition Scoreboard."

Dr. Jacobson gives points to various foods depending on their nutritional content. A food that is high in protein, fish for example, would receive a high score. A food that is heavily laced with added sugar or saturated fats (high in cholesterol) would score low.

Although some foods may contain many nutritional substances, their nutritional score may be low because they also contain substances that could be harmful in too large amounts. For example, ice cream has protein, calcium, and other nutritious substances, but it gets a low rating (-18) because of sugar and saturated fats.

In determining a final rating, Dr. Jacobson gave plus points for such items as protein, unsaturated fat (as found in margarine and fish), vitamins, and naturally occurring sugars. He substracted points if a food contained substances such as saturated fat or added sugar.

The beauty of Dr. Jacobson's rating system is that he does not say "Thou shalt never eat any sweets or desserts anymore." What the Nutrition Scoreboard does show you is that if you do have a glass of soda, you should eat some very nutritious food. If at the end of each day you get 700 to 1,000 nutritional points, you will be doing OK.

Check out your food habits for a week. Record your totals. If your diet is inadequate, find ways to improve it.

Nutrition Scores

Beverages (nondairy)		
Awake	4 oz.	10
Hi-C	4 oz.	3
Kool-Aid	8 oz.	-55
Orange juice	4 oz.	62
Orange Plus	4 oz.	20
Soda Pop	12 oz.	-92
Tang	4 oz.	30
Tomato juice	4 oz.	37
V-8 juice	4 oz.	40

ACTIVITY 1-2 REF: (Continued)

Bread, Rice and Pasta		
Bread, American rye	2 slices	29
Pumpernickel	2 slices	26
White bread, enriched	2 slices	22
Whole Wheat	2 slices	26
Bun, hamburger	1	18
Macaroni, enriched	3/4 cup	26
Noodles, egg enriched	0.9 cup	28
Rice, brown	1/2 cup	22
instant, enriched	1/2 cup	14
white, enriched	1/2 cup	16
Saltines	4	8
Spaghetti, enriched	3/4 cup	26
Desserts		
Brownie	1	-30
Cake	1/12	-15
angel food	3 oz.	-52
chocolate		
Fruits		
apple	1	12
applesauce		
sweetened	1/2 cup	-35
peach	1	29
peaches, canned		
in syrup	1/2 cup	-24
pineapple, canned		
in juice	1/2 cup	4
pineapple, canned		
in syrup	1/2 cup	4
Ice cream	3 oz.	-18
Ice-cream soda	8 oz.	-79
Jello	1/2 cup	-45
Melons		
cantaloupe	1/4 melon	99
watermelon	2 lbs.	74
Pie		
apple	6 oz.	-40
Morton, coconut cream	1/4 pie	-62
Snack Pack, Hunt		
fruit cup	1 cup	-19
vanilla pudding	1 cup	-20
Canned Soups (one cup)		
Beef broth (bouillion)		8
Chicken noodle		10
Chicken with rice		9
Chunky beef		63
turkey		76
Clam chowder		
New England style		34
Onion soup		8

ACTIVITY 1-2 REF: (Continued)

Meat, Fish, Poultry		
Chicken	2.7 oz.	62
breast	2.7 oz.	62
drumstick	1.3 oz.	26
Cold Cuts		
bologna	2 slices	2
salami	2 slices	27
Eggs	2	36
Fish		
cod	3 oz.	40
tuna	3 oz.	55
Hamburger	3 oz.	34
Hamburger		
McDonald's (small)	1.6 oz.	18
Hot dog, pure beef	1	6
Lamb		
chop	2.6 oz.	43
Liver	2 oz.	172
Beef	2 oz.	172
Chicken	2 oz.	158
Sausage	2 oz.	104
Pork		
bacon	3 slices	4
chop	1.7 oz.	29
chop, lean	1.7 oz.	47
ham, boiled and sliced	2 oz.	22
Roast		
pot	3 oz.	33
shrimp	1 1/2 oz.	24
spam	3 oz.	4
Steak		
round	3 oz.	43
sirloin	3 oz.	19
Turkey	3 oz.	52
Veal Cutlets	3 oz.	45
Prepared Meals		
Bounty	1 cup	84
Beef Stew	1 cup	84
Chicken Stew	1 cup	77
Chili con carne with beans	1 cup	65
Franco-American		
Macaroni and cheese	1 cup	44
Spaghetti	1 cup	55
Morton Frozen TV Dinners		
Chicken and dumplings	17 oz.	127
Fried chicken dinner	17 oz.	93
Macaroni and cheese dinner	10 oz.	79
Meat loaf dinner	17 oz.	141
Salisbury steak dinner	17 oz.	125
Sliced beef dinner	17 oz.	136

ACTIVITY 1-2 REF : (Continued)

Swanson's Frozen TV Dinner		
Beans & Franks Dinner		57
Beef deep-dish pie	16 oz.	142
Beef Potpie	8 oz.	60
Chopped sirloin beef TV dinner	10 oz.	76
Filet of Ocean fish TV dinner		125
Meat loaf TV dinner		67
Meat loaf dinner, 3 course		113
Salisbury steak dinner, 3 course		104
Spaghetti and meatballs TV dinner		80
Turkey deep-dish pie	16 oz.	139
Turkey Potpie	8 oz.	58
Turkey TV dinner	11.5 oz.	89
Fresh Fruits		
Apple	1	12
Banana	1	26
Blueberries	1/2 cup	16
Cantaloupe	1/4 melon	99
Grapefruit	1/2	45
Orange	1	68
Peach	1	29
Pear	1	20
Pineapple, diced	1 cup	35
Prunes	4	16
Strawberries	1/2 cup	50
Tangerine	1	34
Watermelon	2 lbs.	74
Snacks		
Apple	1	12
Brownie	1	-30
Candy		
Chuckles	10¢ pack	-98
Mars- almond	10¢ bar	-27
Milk Chocolate	1 oz.	-27
Milky way	10¢ bar	-33
M & M	10¢ pack	-33
3-Musketeers	10¢ bar	-55
Snickers	10¢ bar	-23
Cookies		
oatmeal	1	- 4
sandwich	1	- 7
Cupcake, Sno-ball, Hostess		-44
Granola with milk	1 oz. plus 1/2 cup milk	45

ACTIVITY 1-2 REF: (Continued)

Turkey noodle		15
Tomato		42
Vegetable beef		45
Vegetarian, Vegetable		39

Breakfast Cereals
2 oz. portion unless stated otherwise

Alpha Bits		38
Cap'n Crunch		26
Cheerios		75
Corn Chex		56
Corn Flakes, Kellogg's		61
Cream of Wheat		50
Granola Recipe		25
King Vitamin		161
Life		64
Oat Flakes, fortified		84
Oatmeal, Quaker	2/3 cup	20
Pancakes	three 4" cakes	33
Pebbles, fruity or cocoa		33
Post Toasties		61
Product 19		176
Puffed Wheat	1/2 oz.	13
Sausage, pork	2 links	27
Raisin Bran		96
Rice Chex		62
Rice Krispies		62
Shredded Wheat	1 biscuit	22
Special K		73
Sugar Frosted Flakes		44
Super Sugar Chex		8
Super Sugar Crisp		34
Total		189
Wheat Germ		48
Wheaties		75

Dairy Products

Butter	1 pat	-3
Cheese		
american	2 oz.	32
cheddar	2 oz.	38
cottage	1/2 cup	34
Ice cream	3 oz.	-18
Milk		
skim milk	8 oz.	49
whole milk	8 oz.	39
Yogurt		
Low fat	8 oz.	21
No preservatives	8 oz.	44

ACTIVITY 1-2 REF : (Continued)

Nuts		
almonds	1/2 cup	31
cashews	1/4 cup	24
peanuts	1/4 cup	25
walnuts	1/4 cup	17
Popcorn, butterless	2 cups	6
Potatoe chips	3/4 oz.	8
Odds and Ends		
Butter	1 pat	- 3
Catsup	1 tbsp	2
Honey	1 tbsp	3
Jelly	1 tbsp	- 9
Margarine, regular	1 pat	- 1
Mayonnaise	1 tbsp	- 7
Sugar	1 tsp	-12
Syrup	1 tbsp	-34
Wheat germ	1 tbsp	10
Vegetables		
Asparagus	1/2 cup	49
Beans, baby lima	1/2 cup	41
Beans, canned green	1/2 cup	21
Beans, cut green	1/2 cup	25
Beets, diced	1/2 cup	13
Broccoli, frozen	1/2 cup	116
Brussels sprouts	1/2 cup	73
Cabbage, chopped	1 cup	48
Carrots, canned	1/2 cup	59
Cauliflower, frozen	1/2 cup	54
Celery 8" x 1 1/2"		7
Collard greens	1/2 cup	126
Corn, canned kernel	1/2 cup	18
Corn, frozen kernel	1/2 cup	23
Cucumber, 6 1/8" slices		8
Kale	1/2 cup	118
Lettuce, iceberg	1/8 head	10
Mixed vegetables	1/2 cup	77
Peas, canned	1/2 cup	36
Peas, frozen	1/2 cup	52
Peas and carrots	1/2 cup	80
Potato, baked not including skin	1/2 cup	32
Potato, boiled unpeeled	1/2 cup	25
Potato, french fried	1/2 cup	24
Potato, mashed with butter	1/2 cup	20
Spinach, frozen	1/2 cup	104
Spinach, creamed	1/2 cup	68
Squash, cooked	1/2 cup	55
Sweet potato, baked	1/2 cup	82
Tomato, raw	1	69
Turnips, diced	1/2 cup	23
Turnips, greens	1/2 cup	111

ACTIVITY 3:

Have the students categorize the foods they eat. For example, Protein, Fats, Sugar, Green vegetables, Yellow vegetables, Fruits, Breads, and Junk. If they find one column much longer than the others, perhaps that column should be considered as unnecessary or a luxury. A discussion could follow on what they consider to be a necessity and a luxury in food.

ACTIVITY 4:

Discuss what the students could do with the money they could save from not eating "junk food", or by just cutting down. For example, by cutting out one coke a day, at twenty-five cents, a student would have saved ninety-one dollars and twenty-five cents by the end of one year. Want to look at the figure for one year? Multiply 215 million people times 91.25 and you will get nearly $21,500,000,000! Compute the yearly cost of cigarettes, candy bars, wine, beer, etc.

ACTIVITY 5:

Discuss the energy it takes to make junk food (farm machinery, canning, packaging, processing, distributing, gas, trucks, etc.). What could be done with the money saved from not having made junk foods? Which countries don't have junk foods? Why? What is the general health of the people there?

ACTIVITY 6:

List all of the luxuries we could do without. Which luxuries do we have that other countries do not have?

ACTIVITY 7:

Have the students read Current Science, Volume 60, #7, November 1, 1974, "World Hunger".

ACTIVITY 8:

Have the students read or do "What's it Feel Like to be Hungry?"

ACTIVITY 9:

Have the students read Current Science, Volume 60, # 14, January 17, 1975. "The Energy Crisis and Producing Electricity with Alternate Energy". Then have them play the game N.E.T. p. 8-9

ACTIVITY 10:

Give the students a list of electric appliances and let them choose the ones they want to use. Then tell them they can have only "X" amount of kilowatt hours to spend per day or week.

ACTIVITY 11:

Have the students draw a farm or house that is without electricity. Show film on how people used to live without electricity. Discuss the question "Can people run away to the hills, buy a farm, and live without other people? Then discuss the question, "How can we live together more efficiently?" Be sure to always leave the students with something they can do to make things better.

ACTIVITY 12:

Show the film, "The Great Search." Ask how many students have been to Disney World and seen the Carrousel of Progress. Have the students make a list of the day's activities of a person in the 1700's, 1800's, 1900's and 1976. Compare the "free time" they had and what they did with it. Compare also the rising crime, suicide, and frustration rate, then and now.

ACTIVITY 13:

Have the electric company come to explain how to read a meter and show how the bill is made. He can also share energy saving tips.

ACTIVITY 14:

Have the students write to different agencies for materials to expose them to the types of agencies that are promoting enviornmental education.

Energy Custom Comics Inc.
10 West 19th Street
N.Y.C., NY
Ask for "Our Spaceship Earth Needs More Fuel"

Johnny Horizon "76" Program
U.S. Department of The Interior
Washington, D.C. 20240

National Wildlife Federation
1412 - 16th Street NW
Washington, D.C. 20036

ACTIVITY 14: (Continued)

Environmental Protection Agency
Waterside Mall
401 M. Street SW
Washington, D.C. 20460

Air Pollution Control Association
4400 5th Avenue
Pittsburgh, PA 15213

Water Pollution Control Federation
3900 Wisconsin Avenue NW
Washington, D.C. 20005

Population
Zero Population Growth
367 State Street
Los Altos, CA 94022

ACTIVITY 15:

Smooth a sheet of foil inside a large deep bowl. Fill 1/4 of a test tube with water. Use a thermometer to determine the water temperature. Record the temperature. Tie a string around the neck of the test tube. Leave a long end of string. Record the temperature of the air in the sun. Place the bowl in direct sunlight. Find the focus of the sun's rays on the bowl by holding a white card in front of the bowl. The focus will be where you see a small circle of reflected light on the card. Hold the thermometer in the focal spot for a few seconds, and note the temperature change. Suspend the test tube in the focal spot. Test the temperature of the water at 3-minute intervals. How long does it take for a significant temperature change? Repeat the experiment on a hazy day. Compare the results. Record results in chart form.

ACTIVITY 16:

Set up this problem for the class. An electric company wants to build a facility on the only available land in a particular area. The land provides a refuge for many kinds of wildlife. The company must state its case before the town council which has the authority to grant or deny the company's petition. Local conservationists oppose the project and will present their reasons for opposition. Group the children into three categories: electric company officials, conservationists and town council representatives.

Instruct the "company officials" to write the local electric company to find out how it selects sites for plants and what benefits it offers the community. Instruct the "conservationists" to write local conservation societies to find out how they lobby for the preservation of our natural environment. Have both groups prepare their arguments to present before the town council.

Consider:

As the community grows, the supply of electrical energy must keep pace.
The plant could provide additional jobs which would benefit the community.

ACTIVITY 16 : (Continued)

The community will lose a camping, fishing, and picnicking area.

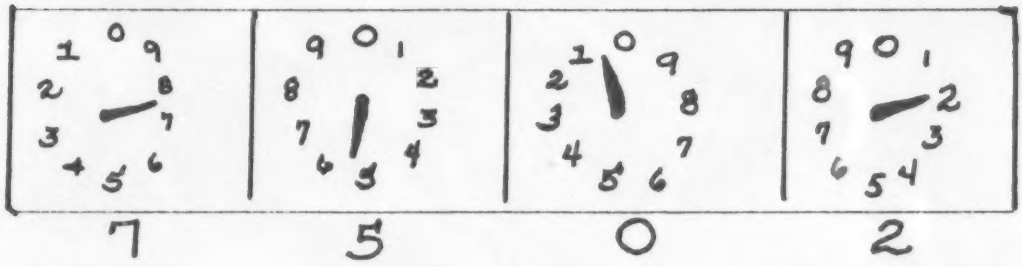
Have the council vote upon the issue and present its decision to both groups.
Discuss your responsibilities as citizens and consumers to become involved in community affairs such as this one.

ACTIVITY 17:

Have the children make a list of ways they and their families can conserve energy. Ask them to find out from the school custodian how they can help save energy at school.

ACTIVITY 18:

Have your students determine the amounts of electricity and water used by their school. Have students locate the water meter and electric meter for the school. Demonstrate the correct method for reading the meters. Always record the number the dial has just passed; for example:



Call the power and water companies to obtain the cost per kilowatt hours and cost per gallon of water. Make meter readings on Monday morning and repeat readings on Wednesday morning. Determine the amounts used and the cost. Take another set of readings on Friday afternoon and Monday morning. Determine the amounts and cost for the weekend. Compare the two sets of readings. How could the usage be reduced during the week and on weekends?

ACTIVITY 19:

Have your class determine the number of kilowatt hours of power used by the school in one week's time. Make a survey of outdoor electric uses and classroom uses that could be cut down. After initiating the power savings again check the school electric meter. How much electricity was saved? Do the same activity at home.

ACTIVITY 20:

YOUR CHOICE

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.
11.
12.

In the boxes opposite, list twelve of your favorite items in your home which need electricity to run.

If there were a law passed which said you had to use less electricity, draw a line through the three (3) items which you could really do without.

Circle the three (3) which really mean the most to you and which you would hold on to until the very end.

Look back over your list and your choices and think:

Why did you decide to do without the three (3) items? _____

_____

_____

_____

Why did you want to keep the other three (3) items? _____

_____

_____

_____

ACTIVITY 20: (Continued)

APPLIANCE SURVEY SHEET

Television
Radio
Stero
Tape Recorder
Movie Projector
Corn Popper
Broiler
Toaster
Fry Pan
Coffee Maker
Mixer
Deep Fat Fryer
Liquifier or Blender
Electric Casserole
Refrigerator
Kitchen Stove
Roaster
Grill
Waffle Iron
Freezer
Knife Sharpener
Garbage Disposal
Dishwasher
Bottle Warmer
Electric Knife
Hair Dryer
Electric Toothbrush
Electric Can Opener
Shaver

Lamp
Sun Lamp
Automatic Thermostat
Electric Blanket
Heating Pad
Sewing Machine
Electric Workshop Tools
Vacuum Cleaner
Floor Polisher
Washer
Dryer
Iron
Water Heater
Garage Door
Lawn Mower
Space Heater
Air Conditioner
Fan
Dehumidifier

ACTIVITY 20: (Continued)

WATTAGE CHART

Using your appliance survey sheet, your choice sheet, and the chart on this page, see if you can answer these questions:

1. How much electricity do your three important items under "Your Choice" use? _____

2. How much electricity do your three crossed through items use?

   _____

3. What items would you give up if you had to save 800 kilowatts a year? _____

   _____

   _____

4. The high energy users are those products which produce:

   a. light

   b. heat and cold

   c. sound

5. Look back at your answers for number 1. How would your way of living change if you had to give up using these items?

	Kilowatts Used Yearly
Water heater	4,219
Air Conditioner	1,389
Refrigerator	1,217
Freezer	1,195
Range (stove)	1,175
Clothes dryer	993
Television (color)	502
(B & W)	362
Dishwasher	363
Microwave oven	300
Attic Fan	291
Roaster	205
Frying pan	186
Portable heater	176
Window fan	170
Iron	144
Fan	138
Radio/record player	109
Coffee maker	106
Washing machine	103
Radio	86
Toaster	39
Waste disposal	30
Clock	17
Floor polisher	15
Blender	15
Hair dryer	14
Mixer	13
Sewing machine	11
Knife	8
Shaver	1.8
Toothbrush	0.5

ACTIVITY 20: (Continued)

APPLIANCE USE WORKSHEET

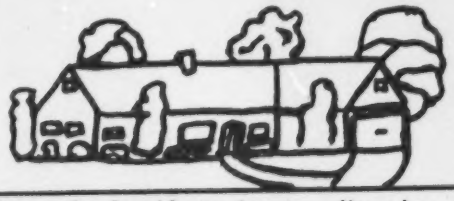
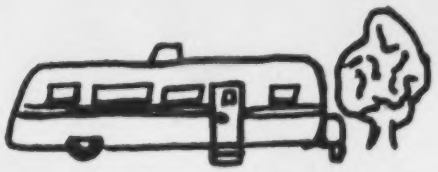
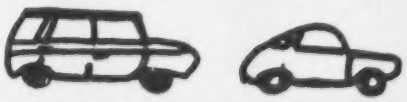
Using the appliance survey sheet, divide the items into three groups--those that are necessary (you feel you must have them to live comfortably), those which are luxuries (you could really get along without them) and debatable (this means those items which you are not sure about). Place them in the column of your choice.

NECESSITY	LUXURY	DEBATABLE

ACTIVITY 21

THE SMITHS AND THE WILSONS

These two families have the same number of family members and live in about the same way. How many differences can you find about the amount of energy they use? Look carefully at the pictures below and read the information given. See how good you are at seeing and thinking. When you have finished looking and reading carefully, turn to the next page and see if you can answer the questions.

SMITHS	WILSONS
Live in a wood frame, 3 bedroom home in the South. The house is surrounded by trees. 	Live in a mobile home, air conditioned, aluminum. Live in the South. 
Burn fuel oil to heat. No air conditioning.	Heat and cool home with electricity.
Live within walking distance to work, school, stores. Own one (1) car.	Live 5 miles from work, school, stores. Own two(2) cars and children ride school bus. 
Wear clothing made of mostly natural fibers, cottons and woolens.	One-half (½) of their clothing is nylon, polyester (man-made fibers).

ACTIVITY 21: (Continued)

WHAT DID YOU SEE?

1) Which family uses the largest amount of energy for heating and cooling? _____

2) Which home is easier to heat? _____

3) Which family spends more for transportation? _____

4) Which family 's clothing uses more energy to make? _____

5) On the whole, which family uses more energy each year?

_____

ACTIVITY 22:

When an individual makes a purchase of a material good, he spends some of his environmental quality as well as his money. Have each student keep a list of the goods and services that their family purchases during the next week. In class have the students analyze their lists and determine what environmental damage was done to produce each of the items that they listed. You will have to help them determine the damage to the environment for some of the items they purchased.

1) Do any of the things your family purchased cause more damage than other items?

2) Could you live without the more damaging items?

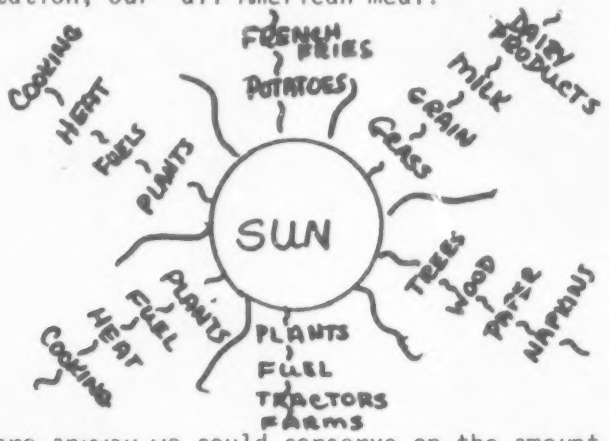
3) When you buy something that has caused environmental damage to produce, is the damage your fault or the manufacturer's fault?

4) Do you frequently have choices between items that will serve the same function?

5) Where one is less damaging than the other (returnable vs. non-returnable), (big car vs. little car, etc.)? Which choice should you make?

ACTIVITY 23:

In the making of a hamburger, french fries and a milkshake, it is estimated that the energy content of the food is but 1/10 of the energy used to produce the meal. With respect to the sun, have students create an energy burst (sun burst) to show, from origin to presentation, our "all American meal."



Is there anyway we could conserve on the amount of energy we use to make our meals?

ACTIVITY 24:

Establish small groups within the classes to gather data concerning student transportation. Count the number of cars in the parking lots, the number of motorcycles and bicycles. Go to the administrative offices and ask how many students are transported by buses. From this data, have students determine the percentages of the student body that ride in cars, motorcycles and on buses. If possible, determine the percentage of fuel saved by mass transportation as compared to driving individual cars.

ACTIVITY 25:

Have your school principal turn off the electricity, water, and/or heat for one day. Have your class interview teachers, school workers, and students about their feelings and reactions to what has happened. Try to keep the entire procedure a secret so that reactions will be more natural. Discuss the results of the survey.

ACTIVITY 26:

Litter is an environmental problem that contributes to air, water, and pollution and adds to the burdensome costs of solid waste collection.

The cost to collect the litter which thoughtless citizens discard in our nations' parks, streets, and other public places averages $88 per ton - more than four times the cost for collection of residential refuse.

Litter is an environmental problem to which children can relate easily. It's also one they can help solve through activities that offer visible results.

An Action Oriented Project:

Organize the students into a Litter Patrol that on designated days picks up litter on the school grounds. Carefully supervise collection of broken glass. Obtain sturdy bags for litter collection; have the youngsters wear protective gloves, and use a broom and dust pan to pick up broken glass. Design special armbands or badges for the patrollers. Keep a photo record of the participants and their accomplishments. Consider maintaining a point system for the amount of litter each youngster collects and at the end of each month present a certificate to the student with the most points.

As a follow-up on litter collection, have your patrollers take on related activities, such as:

Designing anti-litter posters to display in class or school halls. (Ask local merchants to display some of them.)

Staging an anti-litter skit for the school. Show how villainous "litterbugs," "Tommy Trash", or "Lulu the Litterbug", can be foiled by concerted, positive efforts of responsible students.

Designing a litter collage with slogans for the bulletin board.

Surveying the school grounds to determine where the most litter collects. Use a compass for exact location. Make a school grounds "litter map" with a key that explains the kinds of litter.

Writing compositions, poems, or slogans on why schools have litter problems and how to convince litterbugs to change their ways.

ACTIVITY 26 : (Continued)

Discuss what factors affect the location of litter- for example: wind, traffic, recess.

Making certificates of appreciation as special awards for individuals, groups, or companies that are helping to improve and protect our environment. Recipients might be a guest speaker, student, school custodian, newspaper publisher or parent.

Construct litter receptacles for the school.

ACTIVITY 27:

If necessary, obtain parents' permission for this activity.

Identify several nearby locations where litter is usually found. The school grounds, a street corner, bus stop, cafeteria or variety store might be suitable places. Prepare a survey check list so students can record observations. They might record details such as the time of day, date, and location of their survey, the age and sex of the litterbugs they observe and the kind of litter discarded. At noon or some other time of day when you think there will be passersby at the locations, station students in groups of two at the sites. Have them watch for litterbugs and record their observations. Repeat this survey on several days so that the data will be reliable.

ACTIVITY 28:

Organize a one-day community cleanup. Ask parents to help supervise the project and haul collected litter to disposal sites. Ask local merchants to display cleanup posters in their stores and donate bags, containers and protective gloves. Solicit the participation of others in the community. Contact local media to cover the event.

ACTIVITY 29:

Locate a source which will accept recyclable materials. If your community does not have a recycling collection center, find out if any trash collection firms or hauling dealers accept materials to resell to commercial processing plants. Determine what kind of materials (newspaper, bottles, cans) are accepted, inquire about handling requirements and arrange for transportation of materials. Obtain containers for the materials to be collected. You might use barrels, cartons or laundry bags. Prepare labels for the containers. Obtain a supply of sturdy twine if you'll be collecting newspapers which need to be bundled. If you'll collect metals, obtain a magnet to identify them. For one week have the children collect recyclable materials they find on the way to school and during recess. Do not allow them to collect broken glass or other dangerous objects.

ACTIVITY 29: (Continued

After the materials have been collected and transported to the drop-off point, hold a class discussion on the importance of collecting litter for recycling.

ACTIVITY 30:

Have the class research litter laws of your community. Are there fines for littering? Are the laws enforced? When were the laws made? Find out how people feel about no-deposit, no-return cans and bottles. How many would return beverage containers to the store to collect a deposit refund?

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Additional or Revised Activities
for Environmental Guide

Grade level:

Objective:

Materials (if needed):

Activity:

Please return to: Donna R. Strickland
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